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EMISSIONS CONTROL TECHNOLOGY ASSESSMENT OF HEAVY DUTY VEHICLE ENGINES

SOUTHWEST RESEARCH INSTITUTE

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This project investigated the reductions in exhaust emission levels attainable using various control techniques appropriate to gasoline and diesel engines used in vehicles over 14,000-lb GVW. A total of eight gasoline and one diesel engines were evaluated in the laboratory phase of the project. Of the eight gasoline engines, two were evaluated parametrically.

Evaluation of the gasoline configurations included: three engine emissions test procedures using an engine dynamometer, a determination of vehicle driveability, and one vehicle emission test procedure using a chassis dynamometer. The diesel engine evaluation differed only in that two emission test procedures were used on the engine dynamometer. To investigate transient vehicle operation, emissions were measured by the 1975 Federal Procedure normally used for certification of cars and light trucks below 6,000-lb GVW.

The driveability evaluations, performed in appropriately sized trucks, included a cold start driveaway, warm driveability and acceleration performance. A limited study of various economic aspects was made to investigate the cost to control and resultant economic impact.

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Emission Control Technology Division
Ann Arbor, Michigan 48105

December 1973

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FOREWORD

This project was initiated by the Characterization and Control Development Branch, Division of Emission Control Technology, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105. The engineering effort on which this report is based was accomplished by the Emissions Research Laboratory of Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas, 8500 Culebra Road, San Antonio, Texas This project, authorized by Contract 68-01-0472, began on March 8, 1973 and was completed December 8, 1973.

The SwRI Project Leader was Mr. Charles Urban who supervised much of the stationary dynamometer work and was responsible for the economic assessment. Mr. Daniel Montalvo was Assistant Project Leader and was responsible for the stationary engine laboratory studies. Mr. Karl Springer was Project Manager and was responsible for the chassis operated engine, road and laboratory portion of the project.

The Project Officer cognizant of this project was Mr. John J. McFadden of the Characterization and Control Development Branch, Division of Emissions Control Technology, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105. This project was identified within Southwest Research Institute as No. 11-3634-001.

ABSTRACT

This project investigated the reductions in exhaust emission levels attainable using various control techniques appropriate to gasoline and diesel engines used in vehicles over 14,000-lb GVW. A total of eight gasoline and one diesel engine were evaluated in the laboratory phase of the project. Of the eight gasoline engines, two were evaluated parametrically, resulting in an oxidation and reduction catalyst "best combination" configuration, four were evaluated in an EGR plus oxidation catalyst configuration, and two involved only baseline tests. The one diesel engine was evaluated in an EGR plus oxidation catalyst "best combination" configuration.

Evaluation of the gasoline "best combination" configuration included: three engine emissions test procedures using an engine dynamometer, a determination of vehicle driveability, and one vehicle emission test procedure using a chassis dynamometer. The diesel engine evaluation differed only in that two emission test procedures were used on the engine dynamometer. To investigate transient vehicle operation, emissions were measured by the 1975 Federal Procedure normally used for certification of cars and light trucks below 6,000-lb GVW.

The driveability evaluations, performed in appropriately sized trucks, included a cold start driveaway, warm driveability and acceleration performance using special procedures for large trucks. Consideration was given to emission control techniques which may not be effective outside the test procedure and to various economic aspects associated with the "best combinations" of emission controls.

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I. INTRODUCTION

This is another in a series of reports dealing with emissions from engines used to power trucks and buses above 6000 lbs gross vehicle weight (GVW). These reports(1-8)* cover work begun at Southwest Research Institute in 1967 on behalf of the Environmental Protection Agency (formerly the National Air Pollution Control Administration of HEW). This report describes the efforts to assess potential control of emissions from gasoline and diesel powered vehicles of greater than 14,000 lbs GVW and their probable cost in the time span of 1975 to 1980. The following subsections describe previous efforts which bear on this project as well as the objective and other items of introductory nature.

A. Previous Projects

Southwest Research Institute's Emissions Research Laboratory has conducted a considerable amount of research with HDVs beginning in June 1967. Past efforts included acquisition of baseline emission data from 150 gasoline fueled spark-ignited engine-powered trucks and buses using three experimental road-like chassis dynamometer procedures. To acquire the emissions, a special truck version of the constant volume sampler (CVS) was used, which permitted expression of contaminants on mass basis. The detailed results of the survey are contained in the SwRI final report(3). The findings of this study were summarized in AIChE and SAE papers(4, 5) which described the preparations and baseline data results, respectively.

The second major work in this program measured hydrocarbon (HC), carbon monoxide (CO), and nitric oxide (NO) emissions produced during road operation and compared the emission levels to chassis dynamometer emissions by the Federal nine-mode constant speed cycle (FTP). This project involved a total of six trucks of various sizes and makes. Using a CVS with the then current FTP, various procedural modifications were investigated to determine methods for improving the agreement between the Federal procedure and road operation(6).

The third in this series of projects, sponsored by the Environmental Protection Agency, was completed in April, 1972. The first of this multiphase project was a broad emission characterization study of four 1969 trucks under a wide variety of engine speeds and power levels. Emission rates of hydrocarbons, carbon monoxide, and nitric oxide were expressed in mass units of grams per minute, per pound of fuel and per bhp-hr. In addition to the steady-state emission maps, a number of transient accelerations and decelerations were studied using a variety of simulated vehicle inertias. The second phase was a four-vehicle study of the effect of four different road routes on emission rates. This project generated a large body of data that is summarized in the report(5) and included in some detail in a number of appendixes.

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*Superscript numbers in parentheses refer to the List of References at the end of this report.

As a part of EPA Contract No. EHS 70-110, a project involving emission control technology in heavy duty vehicles was completed in November 1972. The objective was to obtain basic emissions data from six currently-produced gasoline fueled engines and to investigate potentialities for emissions control with two of the more popular engines. Two groups of three engines, representing various cylinder configurations and displacements, were tested by the 1972 Federal Test Procedure, a nine-mode constant speed engine dynamometer test method. The concentrations were then converted to mass emissions for the nine-mode schedule using the 1974 Federal Test Procedure applicable to heavy-duty gasoline engines. Each engine was also tested by an experimental three-speed and multi-load schedule with expression of emissions on a grams per bhp-hour basis. The emissions of interest were unburned hydrocarbons, oxides of nitrogen, carbon monoxide and aldehydes. One popularly used V-8 engine from each manufacturer's group was subjected to a limited series of laboratory tests to demonstrate control device effectiveness. This part of the study was restricted to the use of light-duty items or laboratory-type approaches because of the apparent lack of technology for gasoline engines in heavy-duty service. The experimental multi-modal test procedure was employed to evaluate various control strategies such as basic spark timing, carburetion (air-fuel ratio), air injection, exhaust gas recirculation and an oxidation catalyst singly and in combination. Substantial reductions in all emissions were effected on both engines with a combination of exhaust gas recirculation, air injection and an oxidation catalyst with some increase in fuel consumption and loss in maximum power. For a more complete description of this initial control technology assessment project (Heavy Duty Gasoline), please refer to reference 6. This reference is most helpful to the work described in this report since this project is a continuation of the referenced project. This present effort utilized two of the engines and some of the emission control hardware from the previous project. Also, many of the same instruments, dynamometers and related equipment used in the prior project were used in this project.

B. Objective

The objective of this project was to assess available emissions control technology for a number of gasoline engines and one diesel engine used in vehicles above 14,000-lb GVW. The project involved operation of controlled engines on a stationary dynamometer to measure emission reductions followed by operation of the engine in a truck to determine driveability and emissions improvement with a transient test procedure. Other phases of the project involved the consideration of the control techniques outside the test procedure and an economic evaluation of the "best combinations" of emission controls.

In all, three stationary and two chassis dynamometer procedures were used to evaluate nine engines, eight of which were gasoline. Two of the gasoline engines were tested only in the baseline configuration. The remaining six gasoline engines and the one diesel engine were evaluated in the baseline and one or more emission controlled configurations.

C. Assistance by Manufacturers

Beginning with a February 8, 1973 meeting at the diesel engine manufacturer's plant and extending throughout the course of this project, outside assistance has been solicited. Several engine manufacturers provided engines and available emission control hardware. Catalysts and additional control hardware was provided by a number of the manufacturers of emission controls.

They also provided much needed and helpful advice and guidance during the laboratory, field and analytical portions of the project. Their aid in projecting costs of control and associated operational and manufacturing costs etc. were of timely value to the project. These manufacturers and their technical representatives are to be commended for their cooperation and help throughout this project.

D. Project Reviews

A number of meetings, discussions and status reviews were held during the course of this project with the Project Officer. They occurred on February 8, April 23, May 17 and 18, and November 6, 1973. These meetings were helpful in overall project management. Monthly progress reports and letter reports were issued to keep the Project Officer fully informed with complete data for analysis. Telephone reports were also made to augment the reports and correspondence.

II. EQUIPMENT, INSTRUMENTS, ENGINES, PREPARATIONS AND PROCEDURES

This section contains a brief description of the instruments, equipment and facilities, engines, preparations and procedures used to conduct this project.

A. Exhaust Sampling and Analysis

Two basic types of exhaust sampling techniques were used during this program. The most familiar set of instruments used was the nondispersive infrared (NDIR) sampling train for raw exhaust gases specified in the Federal Register(9) for the nine-mode cycle (FTP). This system is described first. The other technique involved the analyses of raw exhaust using flame ionization detector (FID) and chemiluminescence (CL) instruments.

1. Nine-Mode FTP and EPA Instrumentation

The exhaust gas sampling and analysis system, for the FTP nine-mode cycle, meets the requirements and specifications established in the Federal regulations(9) for heavy-duty vehicle exhaust sampling. A component description of the system is detailed in the above referenced Federal regulations. Nominal full-scale concentration levels for the six NDIR analyzers are as follows:

(1) Low-Range HC - 1000 ppm hexane
(2) High-Range HC - 10,000 ppm hexane
(3) Low-Range CO - 1.5 percent
(4) High-Range CO - 11 percent
(5) CO_2 - 16 percent
(6) NO - 4000 ppm

Usually only a high range 0-11 percent CO analyzer is sufficient, but for this project a low range 0-1.5 percent CO analyzer was added to be able to measure the output of CO from oxidation catalyst systems.

The output of each analyzer is fed to strip-chart recorders. The concentrations from each trace can be obtained from the continuous traces by hand as specified in the nine-mode FTP. The average concentrations are then transferred to computer cards for further processing to obtain composite values for HC, CO, and NO. This method was used as a back-up to the real time computer system normally used. The computer system was designed and assembled by SwRI. This computer utilizes a Data General Super Nova, 8K central processor, and a Computer Products Series RTP 7410 multiplex. The computer program was also prepared by Institute personnel. This computer system was very helpful during this program to determine nine-mode FTP results immediately after completion of the tests. The reliability and repeatability of the on-line computer has been shown to be equal or better than manual chart reading and computer reduction of data. The NDIR cart was subjected to monthly calibrations according to EPA requirements. Suffice to say that no tests were made until initial calibrations were satisfactorily completed.

The nine-mode EPA procedure, a modified nine-mode FTP, required the measurement of emissions by the NDIR cart previously described as well as a lightly heated flame ionization detector (FID) for unburned hydrocarbons and a chemiluminescence type analyzer for measurement of oxides of nitrogen. This instrumentation was identical to that used in the previous project$^{(6)}$ and was originally employed in the 23-mode experimental procedure. The FID and CL instruments will be described in the next section in some detail because of their experimental nature. Neither instrument is a part of heavy duty gasoline procedure as specified in reference 9. The CL analyzer is used with dilute exhaust from the light duty FTP (passenger car) while the FID is used in the light duty FTP on diluted samples as well as in a high temperature application for the 1974 Federal heavy duty diesel test procedure. For purposes of this project, it was required that all nine-mode FTP and EPA tests be made with the FID and CL instruments as well as the six instrument NDIR cart.

2. Experimental 23-Mode Instrumentation

The use of direct stream, raw exhaust, emission sampling and analysis instruments has ample precedent in the case of NDIR type analyzers in which a fairly dry, clean sample is analyzed. To measure CO and CO_2 by NDIR, the usual continuous NDIR cart used for nine-mode testing was used. HC by NDIR was of secondary importance since it is known to understate the HC concentrations in most modes of engine operation. A lightly heated FID was used to analyze raw exhaust that had not been cooled below the dew point of the water vapor contained therein. Condensation of water causes severe operational problems and it also is indicative of possible losses of some unburned hydrocarbons by condensation. For gasoline engine exhaust, the industry-accepted practice is to hold the sample, sample lines, and FID analyzer at about 160°F and, of course, no ice-water condensate trap was employed. Good operability at this temperature with an SwRI design HC analyzer was found in the prior project.

In an earlier project dealing with the 23-mode test$^{(5)}$, it was found that the Beckman Model 400 FID, widely used with dilute gasoline exhaust, was unsuited for raw gasoline engine exhaust. Rather than attempt to modify the instrument with uncertain results, it was decided to use an SwRI design FID and operate same at 160°F. The basic design and theory of operation was discussed in an SAE paper$^{(10)}$.

To improve time response, the SwRI FID oven was located adjacent to the engine exhaust pipe. A fairly short stainless steel sample line, heated by a cylindrical heater, was controlled to maintain a 160°F gas temperature while oven temperature was held at 160°F. The sample probe was of standard design for auto exhaust and located adjacent to the probes used for the CO, CO_2, and NO_x samples.

To monitor the substantial HC sample bypass flow, a rotameter was connected to the effluent from the FID. Since the water vapor was still in the exhaust and condensed in the rotameter at room temperature, a small ice trap was added. The ice trap was located in the system between where the sample was split from the main stream and the rotameter. This is standard laboratory practice when a flowmeter is used to help monitor sample bypass flow. Use of a high sample bypass rate greatly improves the system time response.

A Thermal Electron Corp. (TECO) Model 10A chemiluminescent NO_x-NO analyzer, furnished by EPA, was used to measure NO_x. The TECO instrument analyzed a sample obtained via a separate line from the exhaust pipe. Since water vapor has a sizeable positive interference on the NDIR NO reading, a bone dry sample, commonly achieved by a chemical drying agent such as Aquasorb or Drierite has been standard practice. This has always been a controversial step in sample preparation and the recent trend has been, where possible, to use the chemiluminescent method which does not require it.

The TECO and other commercial chemiluminescent analyzers, however, were not designed to handle raw, undiluted, exhaust and suffer from operational difficulties if the majority of the water vapor is not removed. The current chemiluminescent analyzers operate at room temperature and do well with highly diluted exhaust such as from a constant volume sampler or with atmospheric samples. Raw exhaust contains the water vapor from combustion along with the intake air humidity and removal with an ice-water-type trap is necessary to prevent water from filling or coating the sample lines and the capillary.

In undiluted gasoline exhaust, NO_2 represents about three percent of the total NO_x, defined as NO + NO_2. NO_2 is readily absorbed by water and the efficiency depends on residence and contact area. As the lesser of two evils, an ice-water-type trap with minimal residence time and water-to-sample contact time was used to prevent the sampling lines and other tubing, capillary, etc., within the instrument from becoming water logged. In practice, the same trap used for the NDIR was employed. No chemical drying agent such as Aquasorb or Drierite was used. On several occasions, the effect of the trap on NO_2 was checked by flowing a known concentration of NO_2 span gas through the system at various times during the run with the trap wet and the fiberglass particulate filter "dirty". From this, it was found that on an average about 10 to 12 percent of the NO_2 was absorbed, making all measurements of NO_2 subject to this slight error of less than 1 percent. One solution would be to heat the sample line, pump, etc., from point of sample to entrance of the sample into the reaction chamber.

An analysis of side-by-side NDIR and CL data from a previous project(5) revealed a fairly close correlation. In practice it was found that the NO by CL was typically 50 ppm lower than the NDIR making roughly a 10 percent composite difference. The conclusion of such tests was that either system was satisfactory and the CL was preferred since it eliminates the difficult-to-resolve question of the effect of chemical drying agents on NO readings.

The two top photographs in Figure 1 show the instruments used for the nine-mode FTP and EPA and the 23-mode procedures with stationary-operated engines. The tall cabinet in the upper left view houses the NDIR NO and the CL NO_x instruments. Shown in the right view is the NDIR cart for HC, CO, and CO_2 analysis and heated FID system for HC measurement. All tests were made with samples obtained at a point representing average exhaust system length and the lengths of the sample lines were kept to a minimum. Usually the sample lines were less than six feet.

3. Heavy Duty Diesel Emissions Instrumentation

The one diesel engine evaluated required test for both gaseous and smoke emissions by the current Federal Test Procedure(9).

a. 13-Mode Gaseous Diesel

The Federal method calls for measurement of emissions of HC, CO and NO using heated FID for HC and NDIR analyzers for CO and NO. The two top photographs in Figure 2 shows the instrumentation cart used in this project. HC was measured using an SwRI design high temperature HC FID(10) that was optimized according to SAE Recommended Practice J-215. CO and NO were measured by NDIR analyzers in a system that conforms to SAE Recommended Practice J-177. Both SAE Recommended Practices are referenced in the 1974 Federal Certification Procedure for Heavy Duty Diesel Engines(9).

b. Exhaust Smoke Opacity

A standard PHS Full Flow Light Extinction diesel smokemeter built to specifications in Reference 9, was used to measure the smoke opacity during a Federal HD Diesel Smoke Test. The instrument shown in Figure 2 (lower half of page) consists of a detector and a read-out meter

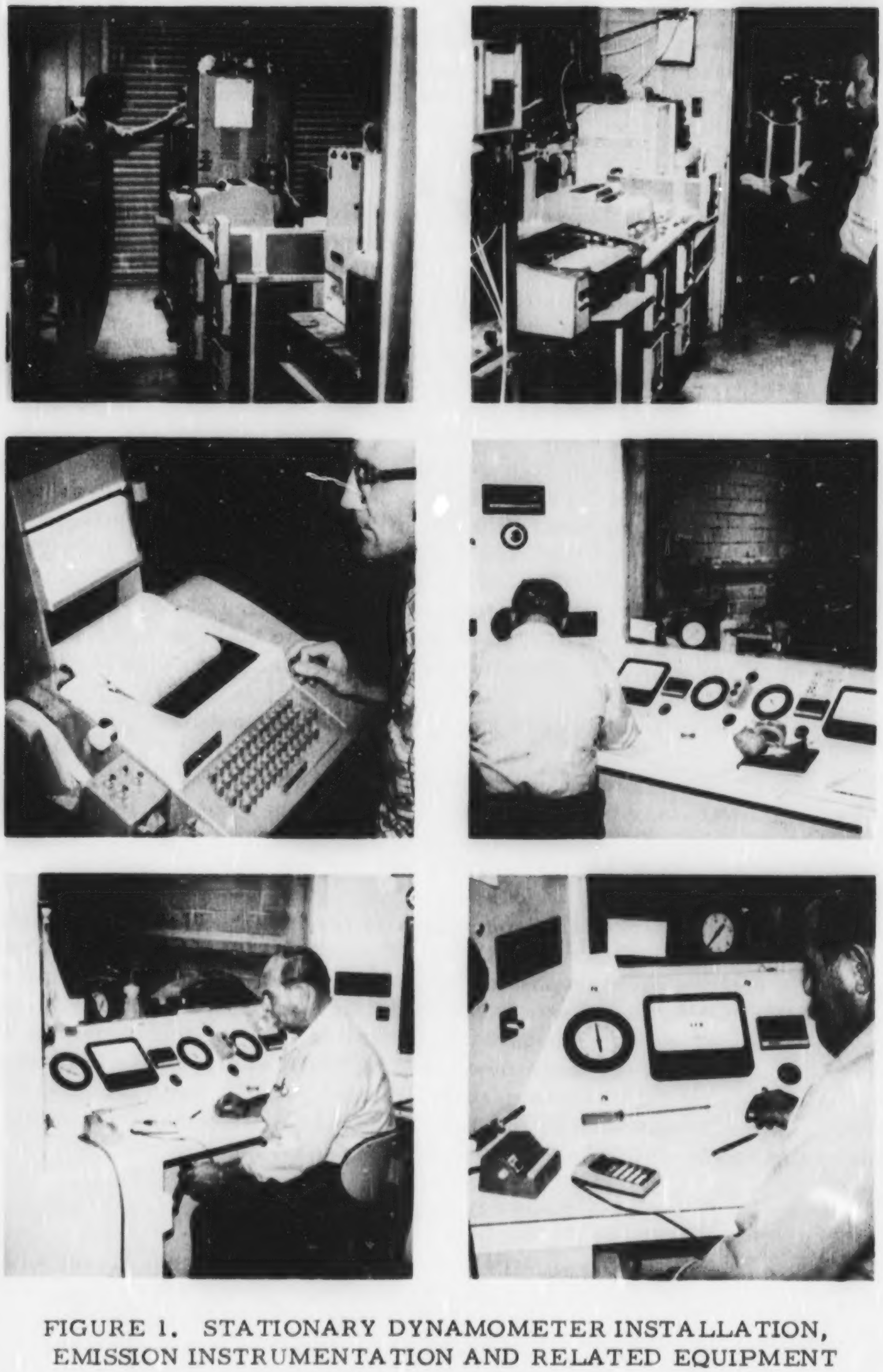
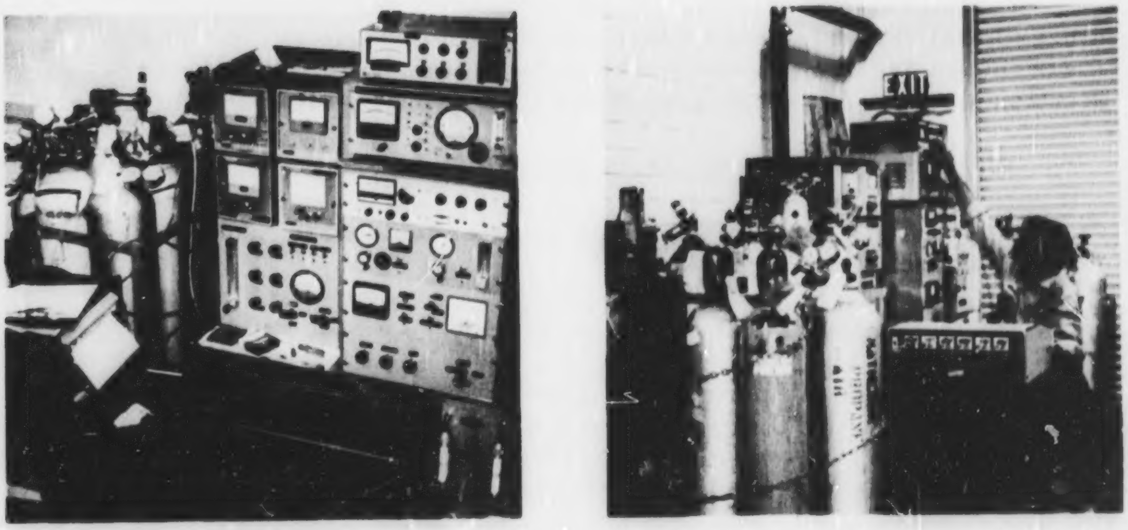
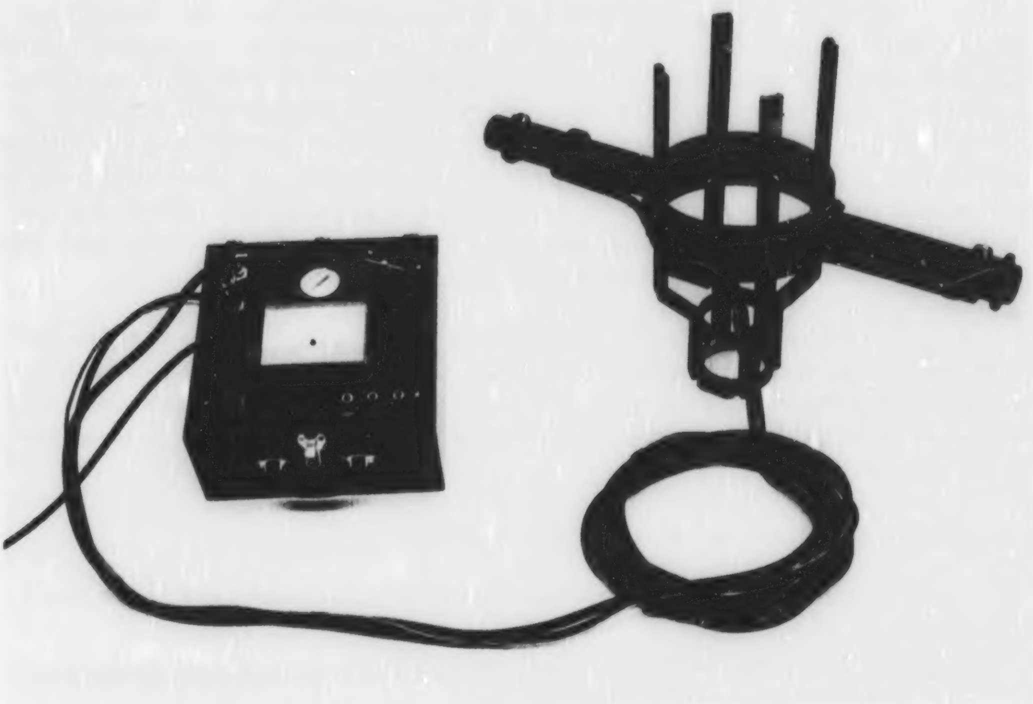


FIGURE 1. STATIONARY DYNAMOMETER INSTALLATION, EMISSION INSTRUMENTATION AND RELATED EQUIPMENT



Gaseous Emissions Analysis System



Smokemeter

FIGURE 2. DIESEL EMISSIONS INSTRUMENTATION

with external output for continuous recording on a strip chart. The smoke measuring system conformed to that required for a smoke certification and included calibration using EPA named neutral density filters.

4. Chassis Dynamometer Exhaust Instrumentation

Two types of chassis dynamometer tests were made and each involved separate instrumentation.

a. Chassis Version of Nine-Mode FTP

The top portion of Figure 3 illustrates the NDIR emissions measurement cart and computer used for this series of tests with gasoline powered trucks. This system prints out run results for HC in ppm n Hexane, CO in percent, and NO in ppm according to the 1970-1973 procedure(11). The lower photograph in Figure 3 shows a truck prepared for test on the constant speed chassis dynamometer.

b. Light Duty FTP-Chassis Test Instrumentation

The Federal Light Duty Test procedure for cars (below 6000 lbs GVW) powered by gasoline and diesel engines involves transient operation during which the exhaust is diluted by means of a constant volume sampler (CVS). A truck size CVS, with nominal 600 SCFM flow capacity, was used to acquire dilute samples from both the gasoline and diesel powered trucks. The upper left photo in Figure 4 shows the bags of diluted exhaust being obtained. In the left part of the photo is another high temperature hydrocarbon analyzer for the continuous measurement of HC during the test. This analyzer was only used during tests with the diesel and was employed as specified by the applicable Federal Register(12).

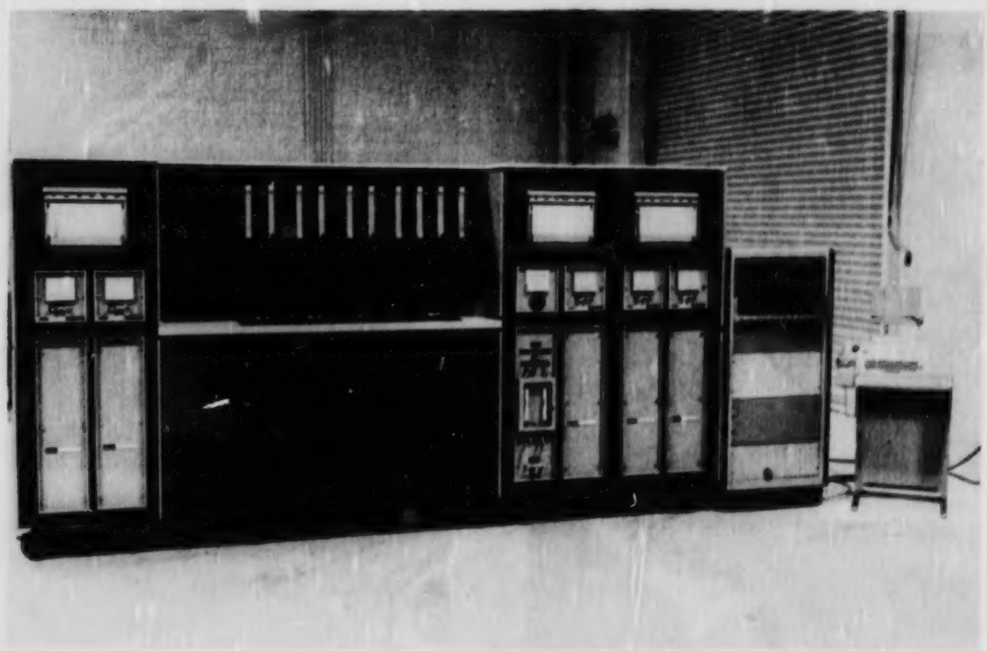
The upper right photograph of Figure 4 shows the analytical system for measurement of the diluted CVS samples. This analytical cart and the constant volume sampler were prepared, calibrated and used in accordance with the appropriate Federal specifications and regulations given in reference 9.

B. Dynamometers and Related Facilities

In all, three stationary and two chassis dynamometers were used in the course of the project.

1. Stationary Dynamometers

Three all electric absorbing-motoring machines with constant speed capability were used. One was a Eaton Dynamatic 500 absorbing-200 motoring unit, while the other two were Midwest Eddy current absorbers of



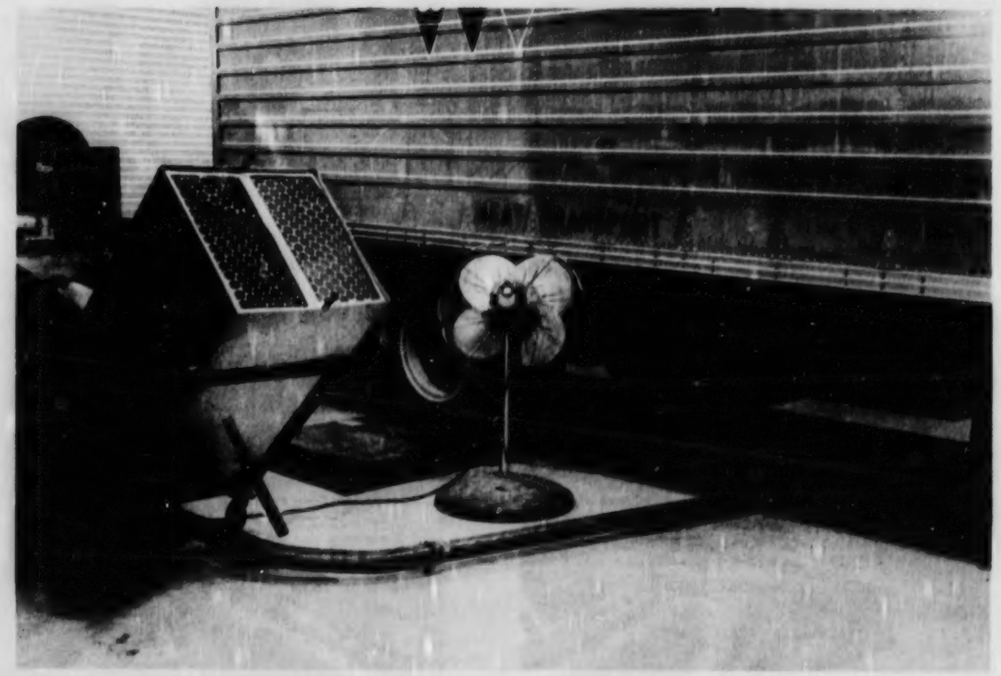


FIGURE 3. CHASSIS SIMULATED NINE MODE FTP INSTRUMENTATION

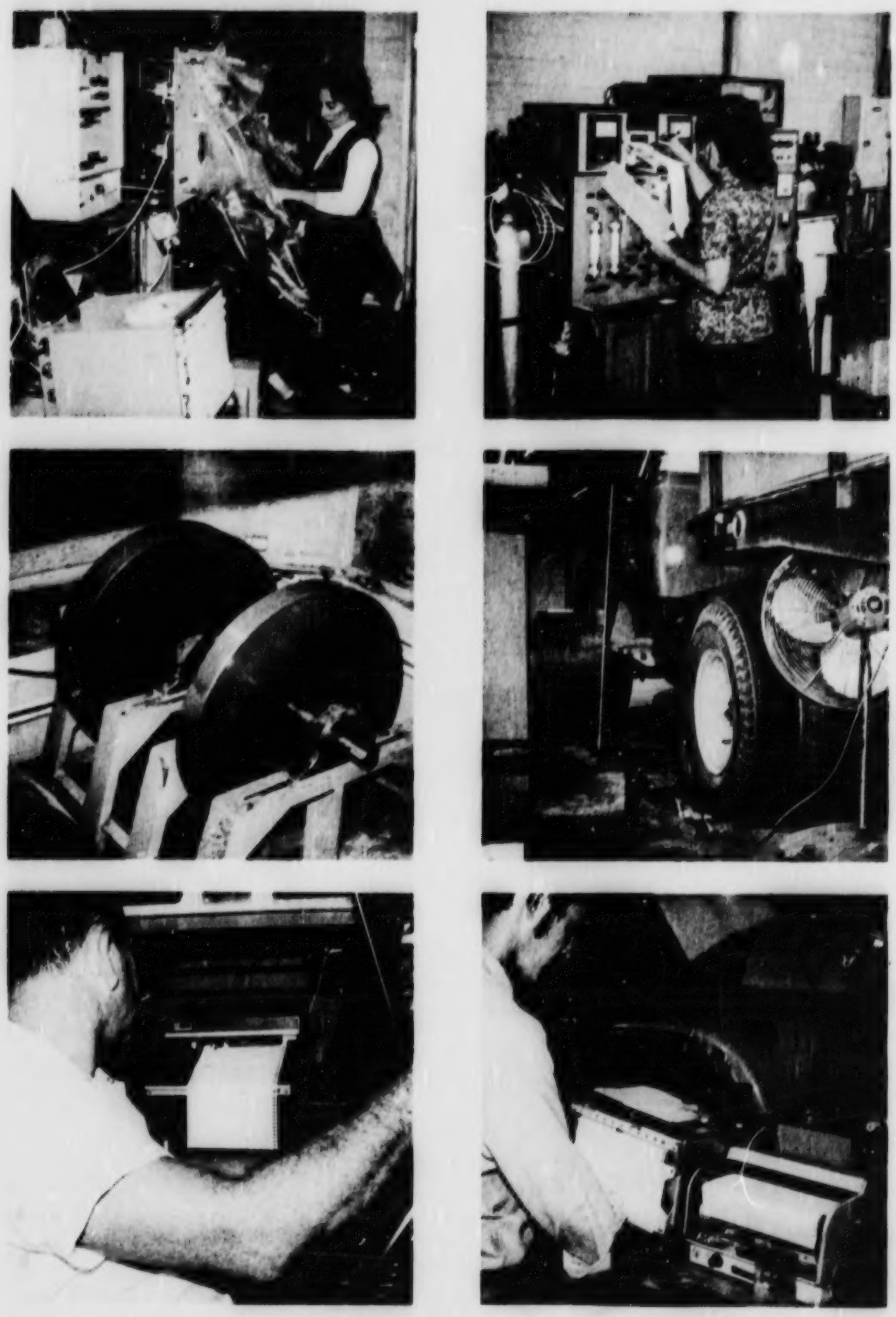


FIGURE 4. CHASSIS DYNAMOMETER EMISSIONS TESTING EQUIPMENT AND INSTRUMENTATION

500 and 175 hp capacity respectively to which a 50 hp electric motor was gear belt connected. This allowed constant speed and motoring capability at 1200, 2000 and 2300 rpm, the major engine speeds of interest.

The center right and lower two photographs of Figure 1 depict the engine test cell console and cell proper with an engine in place. All dynamometer installations were fully equipped with strain gage or hydraulic load read-outs, digital temperature read-out, digital and conventional dial type rpm read-out in addition to the usual pressure gages and manometers for measurement of oil, fuel, water, exhaust, EGR, intake vacuum, inlet restriction and other standard pressure readings as required. Some of these may be noted in Figure 1.

Not shown is the fuel measurement equipment which consisted of a conventional weigh scale to measure the time for a given quantity of fuel to be consumed and a 0-100 lb Flo-Tron. The Flo-Tron was relied on for most fuel rate determinations with spot checks against the weigh scale after every test and complete calibrations against the weigh scale on a once a week basis. This approach was used for both gasoline and diesel engines. Air flow on the diesel was measured using a long radius air flow nozzle calibrated against an NBS certified Merriam Laminar Air Flow element. The air flow measurement was made in accord with SAE recommended Practice J-244.

2. Chassis Dynamometers

The dynamometer used for the nine-mode tests was a Clayton CT-200 200 hp absorbing capability. To this was connected a 50 hp electric motor which, by means of gear belt drive, could provide the constant speed required for the test. This dynamometer is depicted in the bottom photo of Figure 3 and has been widely used in previous gasoline emissions projects.

The dynamometer used during the light duty FTP transient tests over the LA-4 driving schedule is shown in the center views in Figure 4. The left middle photo shows the two inertia wheels used to simulate the weight of the vehicle. When the one on the left was used, a vehicle weight of 16,000 lbs was simulated. When both were used, a vehicle weight of 25,000 lbs was simulated. These wheels were direct connected to another Clayton water brake dynamometer with 8 5/8" diameter rolls, actually the back half of a tandem axle dynamometer. In this project, only single drive axle trucks were tested. The water brake is similar and has similar road load characteristics to those used in the car size dynamometer for 1975 light duty testing.

The two lower photos of Figure 4 show other instruments used in running the transient tests, the driver aid strip chart pre-printed LA-4 driving schedule and the catalyst exhaust temperature recorder and intake manifold-vehicle speed time trace recorder. Figure 5 shows a number of

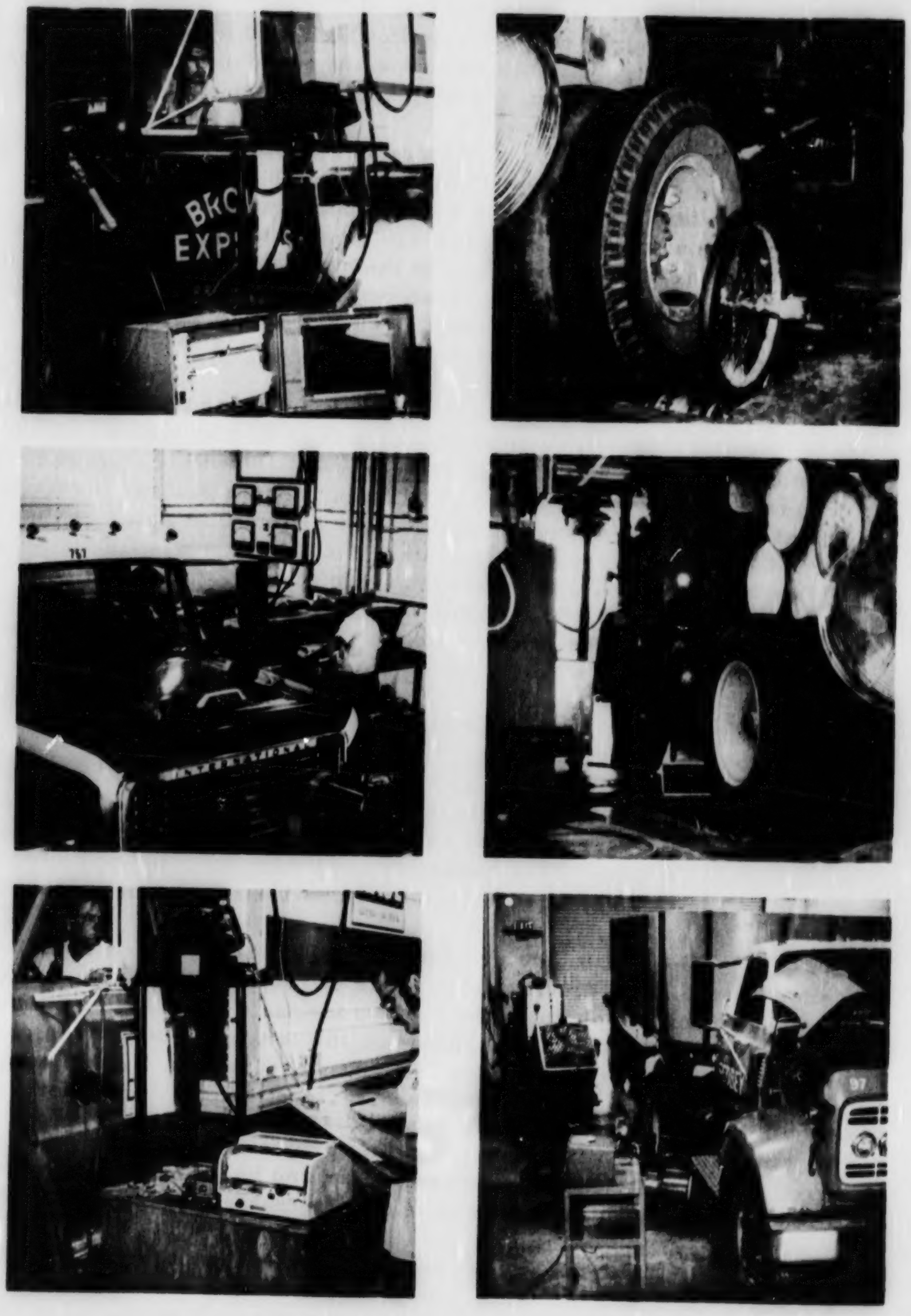


FIGURE 5. CHASSIS DYNAMOMETER OPERATED CONTROL EQUIPPED ENGINES IN TRUCKS

other views of the test set up, dynamometer and related facilities employed to conduct the light duty procedure with the heavy duty trucks.

C. Instrumentation For Field Evaluation

The operation to determine cold start driveaway, warm driveability, performance and catalyst exhaust temperatures required the use of a variety of instruments and equipment to measure road speed (mph), distance (miles), engine speed (rpm), fuel rate with the diesel engine, intake manifold vacuum with the gasoline engines, exhaust backpressure, EGR signal pressure, intake restriction and catalyst temperatures.

Figure 6 contains six photos of the equipment and instruments used. The upper right photo shows the diesel fuel rate meter used on the road while the vehicle speed and distance read-outs are shown in several views. A Labeco 5th wheel, shown in the lower left view, provided the speed and distance signals for read-out in the cab. Both middle and lower right views show a dual temperature read-out which were connected to Chromel-Alumel type thermocouples located before and after, or sometimes in the catalysts. The lead wires are shown in the middle left photograph as they connect to an oxidation catalyst under one of the trucks. The large round dial face in the lower right view is the intake manifold vacuum gage and square face instrument was used to measure engine speed.

D. Related Support Facilities

The previous portions of this section have briefly described a wide range of instruments and equipment, as wide and varied as any used on previous projects. Although the extent of instrumentation used may be impressive, the accuracy of the results is of major importance. This is where the long range program of quality assurance, attention to detail, and concern about test data reliability that has been the goal of the Emissions Research Laboratory has been put to the test.

For example, to maintain and perform the specified calibrations, as required by the applicable Federal Registers, is no small job when this number and variety of tests are involved. Every instrument, dynamometer, smokemeter, CVS, pressure gage, temperature read-out etc. was periodically calibrated according to EPA or SwRI procedures. Gases for NDIR, FID, and CL instrument span were named from EPA calibrated gases. As a part of a recently completed project for EPA on baseline emissions from smaller trucks, a truckload of gasoline and diesel range calibration gases were named by EPA. These formed the basis for the primary instrument calibrations.

There are numerous other examples of the support of this project in terms of daily, weekly and monthly checks, spans, and calibrations. Even

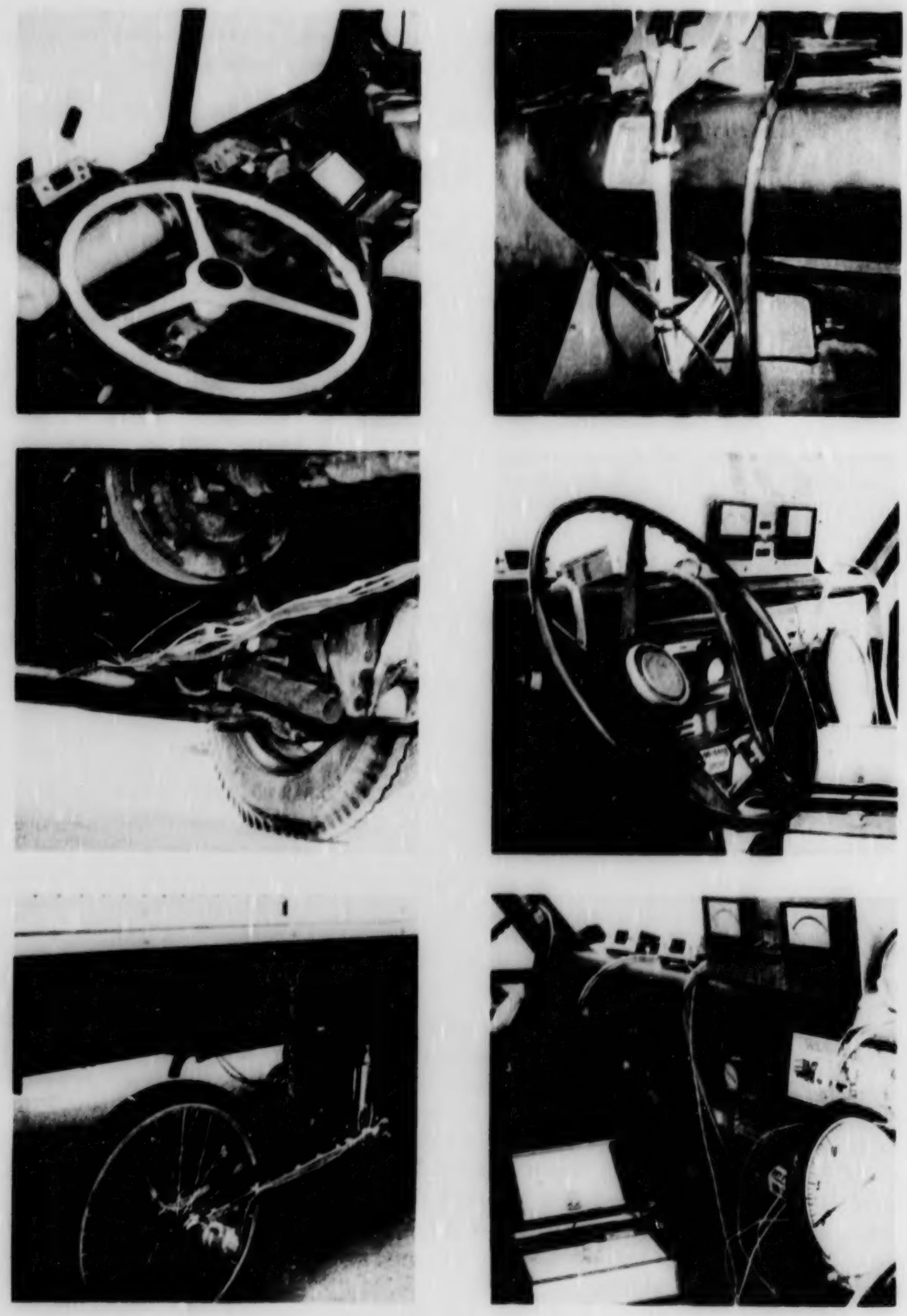


FIGURE 6. INSTRUMENTATION USED DURING ROAD TEST

the diesel engine, furnished by EPA, was cross checked with the Ann Arbor EPA Certification Laboratory Branch. Other examples and indications of the care and continual calibration have been mentioned earlier and will be mentioned later in this report. Every attempt was made to obtain factual evidence on the emissions, engine and vehicle behavior as it progressed through the test plan.

E. Engines

In all, a total of nine engines were obtained through the courtesy of the manufacturers. Of the eight gasoline engines, two were inline six cylinder, five were V-8 and one was a V-6 configuration. The diesel was a V-8 open chamber naturally aspirated engine. At the request of the Project Officer, the engines were coded. The characteristics of the engines are listed below.

TABLE 1. TEST ENGINE DESCRIPTION

Engine		Flywheel Power(1)			Peak Torque		GVW Application
Code	CID	Bhp	at	rpm	lb-FT	at rpm	Min - Max, lbs
Diesel							
1	636	225		2800	511	1400	24,500 - 60,000(2)
Gasoline							
2	361	153		3600	290	2400	22,500 - 34,000(2)
3	350	175		4000	260	2800	5,200 - 26,000
4	345	197		4000	309	2200	5,000 - 46,000
5	318	150		4000	245	1600	5,000 - 25,500
6	400	182		3200	365	1200	27,500 - 62,000(2)
7	432	190		3200	331	1600	23,000 - 50,000(2)
8	501	194		2600	451	1600	30,500 - 66,000(2)
9	440	240		3600	365	3200	6,200 - 26,000

(1)SAE J-245 (net)
(2)Gross Combined Weight for Tractor-Trailer

Engines 1, 4 and 5 were the same make as those used by the Bureau of Mines Petroleum Research Center Project conducted at the same time as the previous SwRI project(16). Engines 1 and 4 were the same make and model as the two engines used by the Petroleum Research Center in their durability testing, conducted concurrently with this project(40). The control configurations used by the Petroleum Research Center and SwRI were as identical as possible as both projects were part of the total EPA heavy duty emissions assessment activity. More on the results of the Petroleum Research Center durability testing will be discussed later.

Engines 2 and 3 were the same as engines 1 - 3 and 2 - 3 from the prior SwRI project(6). Engines 6 and 7 were used in the parametric engine studies while Engines 8 and 9 were for baseline test purposes only. Engines 1, 2, and 3 were in good mechanical condition but were not new. The remaining engines were new or like new when received with the exception of engines 5 and 9 which, according to the manufacturer, had been used previously as R&D engines. Most engines were supplied with flywheel, flywheel housing, starter, generator, air cleaner, exhaust piping and muffler. Rubber or other special engine mounts were furnished by those manufacturers who felt they were desired. More on engines and control systems will be included in the Results.

F. Preparations

Engines 4, 6, 7 and 8 were given variable speed and load break-ins according to manufacturer's recommendations. Once the engine was run-in or otherwise mounted on the laboratory test bed for stationary operation, it was checked to make certain it was running satisfactorily. This generally meant a full power curve with fuel rate and power output measured at a number of engine speeds. For gasoline engines, the principal check points were 1200, 2000, 2300 and generally two higher speeds. The basic timing and engine idle speed adjustments were always according to the EPA factory sticker tune specifications or, where appropriate, to the manufacturer's recommendations. On most engines, it was necessary to readjust timing, idle speed and idle air-fuel ratio. Again, the manufacturer's procedure for setting engine idle air adjust screws was followed in setting air-fuel by idle speed droop. More often, idle air-fuel was adjusted to the desired idle CO using the NDIR CO instrument.

G. Fuels and Lubricants

Both gasoline and diesel engines were involved in this project, requiring the use of special fuels.

1. Gasoline Engines

As specified in the February 22, 1973, letter from the EPA Project Officer, Mr. John J. McFadden, to Mr. K. J. Springer of SwRI, the composition of the gasoline fuel used in this project was in accordance with the MSPCP Advisory Circular #26, "Lead and Phosphorus Content of Unleaded Fuel for Certification Testing". The composition of the gasoline fuel used (Coded EM-191-F) is given in Appendix M-4. No method was prescribed for determination of these low values of lead and phosphorus. This fuel, as blended by a local refinery, met all the requirements of Circular #26 with the exception of the phosphorus content. The phosphorus level was increased by the addition of an Ignition Control Compound, ICC-1. ICC-1 is not the most widely used phosphorus containing Ignition Control Compound, but was determined to be satisfactory and was also the only compound readily available in small quantities (less than 200 ml. of the compound was required).

Prior to final selection of this gasoline fuel, each of the engine manufacturers was contacted to assure that all the engines were designed to operate on "regular" gasolines with an octane rating of 91 Research Octane Number (RON). The 92.5 RON of the gasoline used in this project is in the range of the potential average RON of the overall gasoline base stock (i.e., average of all refinery output prior to adding a leaded octane improver). This fuel, except for the lower RON, meets most of the Indolene Clear Specification. Indolene clear was used in the previous program when testing catalysts. It has a 100 RON and is not termed a realistic unleaded motor gasoline for trucks. The engine oil used in the spark ignition engines was a straight viscosity SAE 30 with Service Classification "SE".

2. Diesel Engines

All smoke and emissions tests were run on ASTM type DF-2 diesel fuel which met the specifications given in the Federal Register(9). The laboratory analysis of the DF-2 fuel is given in Table M-8 of Appendix M.

H. Experimental Procedures

This project involved every test procedure in the Federal Register for motor vehicles except evaporative losses (gasoline). It also involved a number of experimental or specially developed procedures. They are briefly described in the following.

1. Stationary Procedures - Gasoline

Three test procedures were employed with all gasoline engines operated on the stationary dynamometer.

a. Nine-Mode FTP Schedule

The 1974 FTP (nine-mode 2000 rpm constant speed procedure) is adequately described in Section 85.774 of the Federal Register(9). The test schedule is listed in Table 2. The procedure is 20 minutes in length and consists of the Table 2 schedule being run four times. The weighting factors, listed under the column 1974 FTP are used to calculate the final answer in terms of grams per bhp-hr.

Please note that in reality, only six modes, of which only three are power-producing, are included in this 2000 rpm constant speed procedure. The 16-inch condition is repeated four times for 30.8 percent of the weight. The other power-producing modes, Modes 3 and 7, the 10-

TABLE 2. NINE-MODE CONSTANT SPEED PROCEDURES FOR HEAVY DUTY GASOLINE TRUCKS

Federal Test Procedure (FTP)

Sequence Number	Manifold Vacuum	Time in Mode, sec	Cumulative Time, sec	Weighting Factors 1970 FTP	Weighting Factors 1974 FTP
1	Idle	70	70 (1:10)	0.036	0.232
2	16 in. Hg	23	93 (1:33)	0.089	0.077
3	10 in. Hg	44	137 (2:17)	0.257	0.147
4	16 in. Hg	23	160 (2:40)	0.089	0.077
5	19 in. Hg	17	177 (2:57)	0.047	0.057
6	16 in. Hg	23	200 (3:20)	0.089	0.077
7	3 in. Hg	34	234 (3:54)	0.283	0.113
8	16 in. Hg	23	257 (4:17)	0.089	0.077
9	CT	43	300 (5:00)	0.021	0.143

EPA Procedure

Sequence Number	Percent Maximum Observed Torque at 2000 rpm	Time Mode, sec	Cumulative Time, sec	Weighting Factor
1	Idle	70	70 (1:10)	0.232
2	30	23	93 (1:33)	0.077
3	60	44	137 (2:17)	0.147
4	30	23	160 (2:40)	0.077
5	10	17	177 (2:57)	0.057
6	30	23	200 (3:20)	0.077
7	90	34	234 (3:54)	0.113
8	30	23	257 (4:17)	0.077
9	CT	43	300 (5:00)	0.143

Engine Speed 2000 ± 100 rpm.

An initial 5-min idle, two warmup cycles and two hot cycles constitute a complete dynamometer run.

inch and 3-inch modes, account for another 26 percent of the schedule. The three power modes, 16-inch, 3-inch, and 10-inch vacuum, represent a total of 56.8 percent of the cycle weight. The idle (23.2percent weight), 19 inch (5.7 percent weight), and the closed throttle (14.3percent weight) represent the remaining 43.2 percent of the cycle weight.

b. Nine-Mode EPA Schedule

The Nine-Mode EPA procedure differs from the FTP only in that the modes are in percent of maximum torque rather than inches of manifold vacuum. The mode torque settings were provided in an attachment to a February 22, 1973, letter from Mr. John J. McFadden of EPA to Mr. K. J. Springer of SwRI. These torque settings are shown in Table 2 and are the only change in the engine test procedure from the 1974 Federal Test Procedure

In both of the nine-mode procedures, Chemiluminescence (CL) for determination of nitrogen oxides and Flame Ionization Detection (FID) for determination of unburned hydrocarbons are being utilized in addition to the standard NDIR determinations required by the Federal Register. Another additional determination being made is a weighted Brake Specific Fuel Consumption (BSFC).

c. 23-Mode Experimental Schedule

The experimental 23-mode schedule is listed on Table 3 and is the same as used in the prior project, reference 6. Modes 7, 9, and 10, at 1200 rpm engine speed, and modes 18, 20, and 21, at 2300 rpm engine speed, carry a zero weighting factor. Modes 7, 9, 10, 18, 20 and 21 were measured to obtain emission data that may be of use later. The 23-mode schedule and procedure is quite similar to the 1500-2500 rpm schedule studied in an earlier project and described in detail in Reference 5.

Although a 230 minute long, ten minutes per mode, test was described by the preliminary procedure, earlier work indicated that three minute long modes were quite adequate for an engine mapping-type procedure. As described in the final report(5) dealing with procedural development, the first minute was devoted to changing speed and load, the second minute for stabilization and only the time average of the third minute emission concentration used.

Note that 12 minutes are allocated to mode 12. The additional nine minutes are provided to allow the HC analyzer and sampling system to purge after the very high HC concentration closed throttle (CT) raw exhaust samples have been analyzed. This procedure was found to be quite acceptable with regard to HC hang-up and is felt a necessary part

TABLE 3. EXPERIMENTAL 23 MODE EMISSIONS TEST SCHEDULE
(Heavy Duty Gasoline Engines)

Mode	Engine Speed, rpm	Power Out, %*	Mode Time	Cumulative Time	Weighting Factor
1	Idle	0	3	3	0.07
2	1200	2	3	6	0.06
3	1200	8	3	9	0.06
4	1200	18	3	12	0.05
5	1200	25	3	15	0.03
6	1200	50	3	18	0.06
7	1200	75	3	21	0.00
8	1200	82	3	24	0.04
9	1200	92	3	27	0.00
10	1200	100	3	30	0.00
11	Idle	0	3	33	0.07
12	1200	0 (CT)**	12	45	0.12
13	2300	100	3	48	0.025
14	2300	92	3	51	0.055
15	2300	82	3	54	0.035
16	2300	75	3	57	0.06
17	2300	50	3	60	0.06
18	2300	25	3	63	0.00
19	2300	18	3	66	0.065
20	2300	8	3	69	0.00
21	2300	2	3	72	0.00
22	Idle	0	3	75	0.08
23	2300	0(CT)**	3	78	0.06

*Observed at the flywheel, percent of maximum at a given engine rpm.
**Power out is zero. Engine requires motoring in this mode.

of measuring the very high CT conditions.

2. Stationary Procedures - Diesel

Both gaseous emissions and smoke FTP's were employed with the one diesel engine.

a. 13-Mode Gaseous Procedure

The 13-mode test is described in Reference 9 and is known as an engine exercise in that eleven different speed and load points are employed during which emissions of HC, CO and NO are measured. The procedure is 130 minutes long with 10 minutes given to each mode of the test. It begins with operation at normal low idle followed by operation at an intermediate speed defined as peak torque rpm or 60 percent of rated speed, whichever is higher. The engine is operated at this speed in successive increments of maximum observed power at that speed starting with 2 percent, then 25, 50, 75 and 100 percent of power. Another idle is run followed by operation at rated speed at 100 percent, then 75, 50, 25 and 2 percent of maximum observed power at rated speed. The idle is then rerun. The emission concentrations are averaged during the last minute of each 10 minute period and used in the calculations along with measured air flow, fuel rate and power output.

b. 23-Mode Experimental Procedure

This procedure was performed identical to the gasoline 23-mode experimental test procedure except the HC FID temperature was raised to 375°F.

c. Federal Smoke Test

The Federal smoke compliance test, as performed on an engine dynamometer, is shown by the schematic drawing of engine speed vs. time in Figure 7. It consists of an initial engine acceleration from 150-250 rpm above the low idle speed to 85-90% of rated engine speed in 5.0 ± 1.5 seconds, a second acceleration from peak torque speed (or 60% of rated speed, whichever is higher) to 95-100% of rated speed in 10.0 ± 2.0 seconds, and (following this second acceleration) a full-power lugdown from 95-100% of rated speed to the particular intermediate engine speed (peak torque speed or 60% of rated speed) in 35.0 ± 5 seconds. The accelerations are made against simulated vehicle inertia furnished by large flywheels connected to the dynamometer shaft, and/or against a preset load in the power absorption unit. Three of these sequences constitute one smoke test.

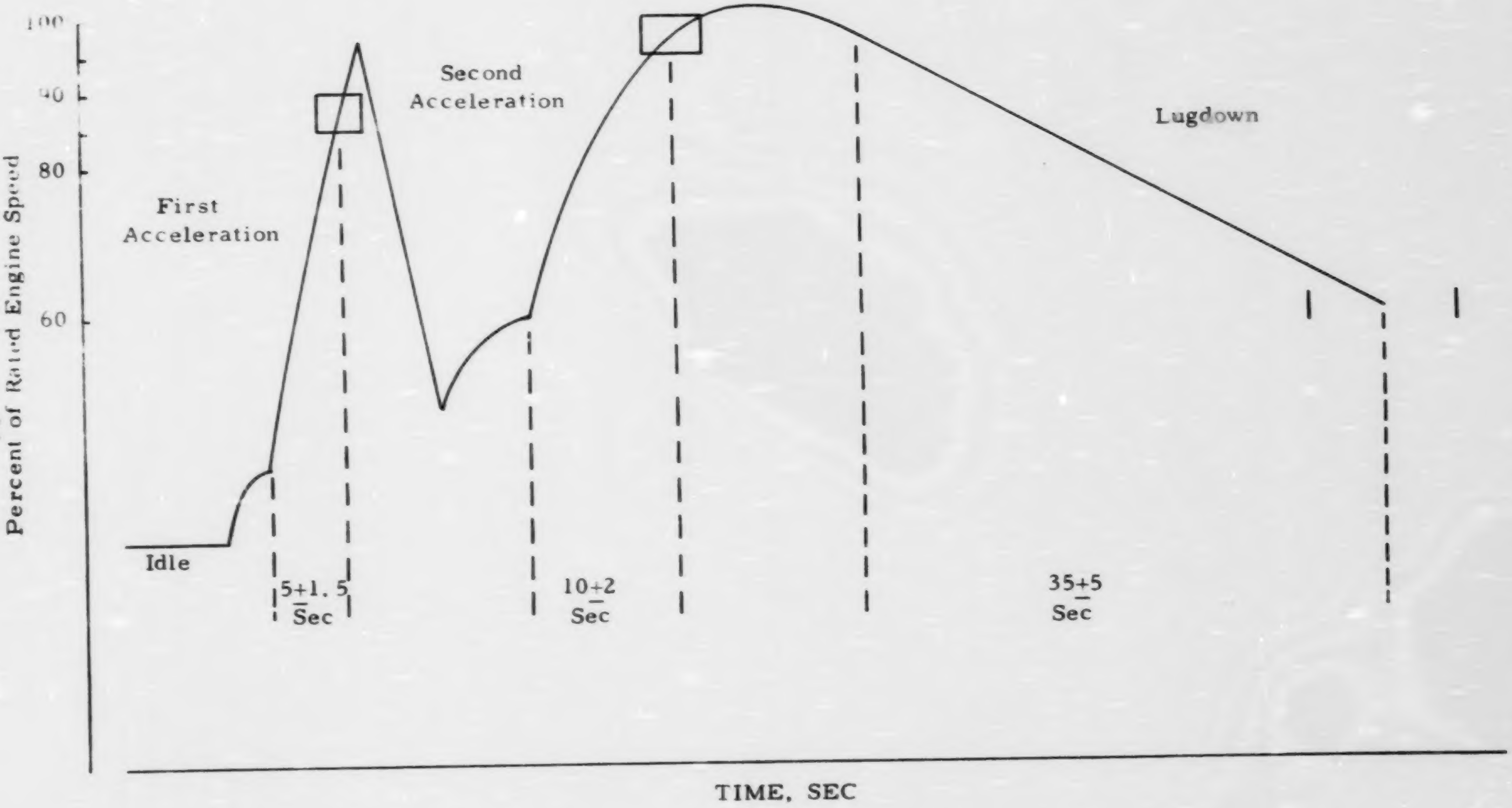


FIGURE 7. SCHEMATIC OF ONE CYCLE OF FEDERAL SMOKE COMPLIANCE TEST - ENGINE SPEED VS TIME

3. Chassis Procedures

Two types of chassis test procedures were used in this project.

a. Chassis Alternative of Nine-Mode FTP

The original nine-mode test was developed by the California Air Resources Board and the Automobile Manufacturers Association. It began as a simple chassis test with a stationary alternative. When this method was adopted as Federal Test Procedure, the chassis alternative was dropped. It is identical to the stationary test as far as schedule, etc., is concerned. In this test program, the weighting factors, shown in Table 2 under the heading "1974 FTP" were used. Reference 7 contains a full description of this test procedure.

b. 1975 Light Duty FTP - Gasoline

As an experiment, the 1975 FTP, less evaporative emissions, described in Reference 9 was attempted with all gasoline engines except the two baseline engines, numbers 8 and 9. This procedure is 23 minutes long from a cold start followed by a 10 minute soak and then a repeat of the first 505 seconds from a hot start. The three bag 1975 FTP was performed in strict accord with all provisions of the Federal Register. On some trucks the transmission shift speeds were modified and, of course, the exact inertia weight of the vehicle was not necessarily employed. Either 16,000 or 25,000-lb of inertia simulation was used depending on whether a truck or a tractor-trailer truck. The truck powered by Engine 3 was operated at less than 16,000-lb on the medium duty dynamometer.

Road load was set in the dynamometer using average manifold vacuum measured on the road at 50 mph cruise. In the absence of an expression relating truck weight to road load at 50 mph, as exists in the Register for light duty vehicles, this method is quite acceptable. Actual fuel consumed during the 23-minute run and the repeat 505 second run was weighed. The distance traveled was measured by use of a Labeco 5th wheel attached to the chassis dynamometer and riding on the drive roll. For a complete description of the 1975 FTP for LDV testing, please refer to Reference 9.

c. 1975 Light Duty FTP - Diesel

The one diesel powered truck was subjected to operation by the 1975 FTP for diesel powered light duty vehicles. This meant that HC were measured continuously using a sample of the diluted exhaust as it entered the CVS heat exchanger. The provisions of Reference 12 were followed in conducting these tests with integration of the HC continuous trace performed manually. This procedure is in all other respects essentially identical to the 1975 FTP for gasoline powered light duty vehicles. This tractor was operated with 25,000-lb inertia simulation and power set at 50 mph to correspond to a gross fuel rate identical to the gross fuel rate measured on the road at 50 mph on level road.

4. Road Driveability Procedures

This project required the road operation of the diesel and all but two of the gasoline engines in their respective usual truck or truck-tractor applications. The object of this operation was to investigate the general driveability and performance of each controlled engine relative to the baseline or uncontrolled engine. The road evaluation consisted of three major procedures prepared especially for this project. The first was a cold start driveaway around a stop and go type moderate speed closed course. The warm driveability was a rating of the vehicles quality of operation after fully warmed-up.

The third procedure involved acceleration and grade performance to assess the vehicle's performance under loaded, real driving type situations. These three procedures are described in Appendix M-6. They were developed and revised with the advice and consent of the EPA Project Officer and were approved for use on May 17 and 18, 1973. In general, they utilize the available methods in use by the leading truck manufacturers for this purpose and utilize rating definitions that are appropriate to all motor vehicles though most widely utilized with passenger cars. Figure 8 shows several views of the road course used for warm driveability and performance measurement.

5. Engine-Vehicle Test Plan

With the exception of the two baseline engines, engines 8 and 9, the diesel and gasoline engines followed the same basic test plan.

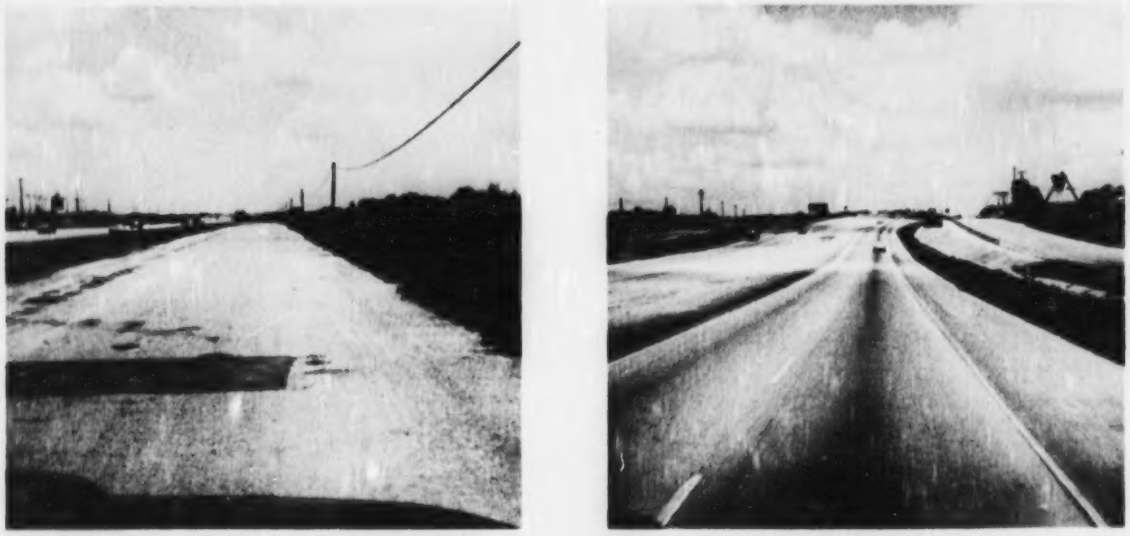
a. Stationary Operated

The engines were mounted on the stationary dynamometer and performance checked. Then a baseline series of tests involving three each of every applicable stationary test procedure was run. For engines which had an alternative baseline configuration such as a California Version, then this battery of stationary tests was repeated. Several views of the engines tested for baseline emissions rates are shown in Figure 9.

Then, a test plan developed in advance and approved by the Project Officer, was followed in which the nine-mode FTP was used as the basic gasoline test method and the 13-mode procedure was the

Warm Driveability Course

Level Road Load Course



Acceleration Performance

Uphill Grade Performance

FIGURE 8. ROAD COURSE USED FOR WARM DRIVEABILITY AND PERFORMANCE

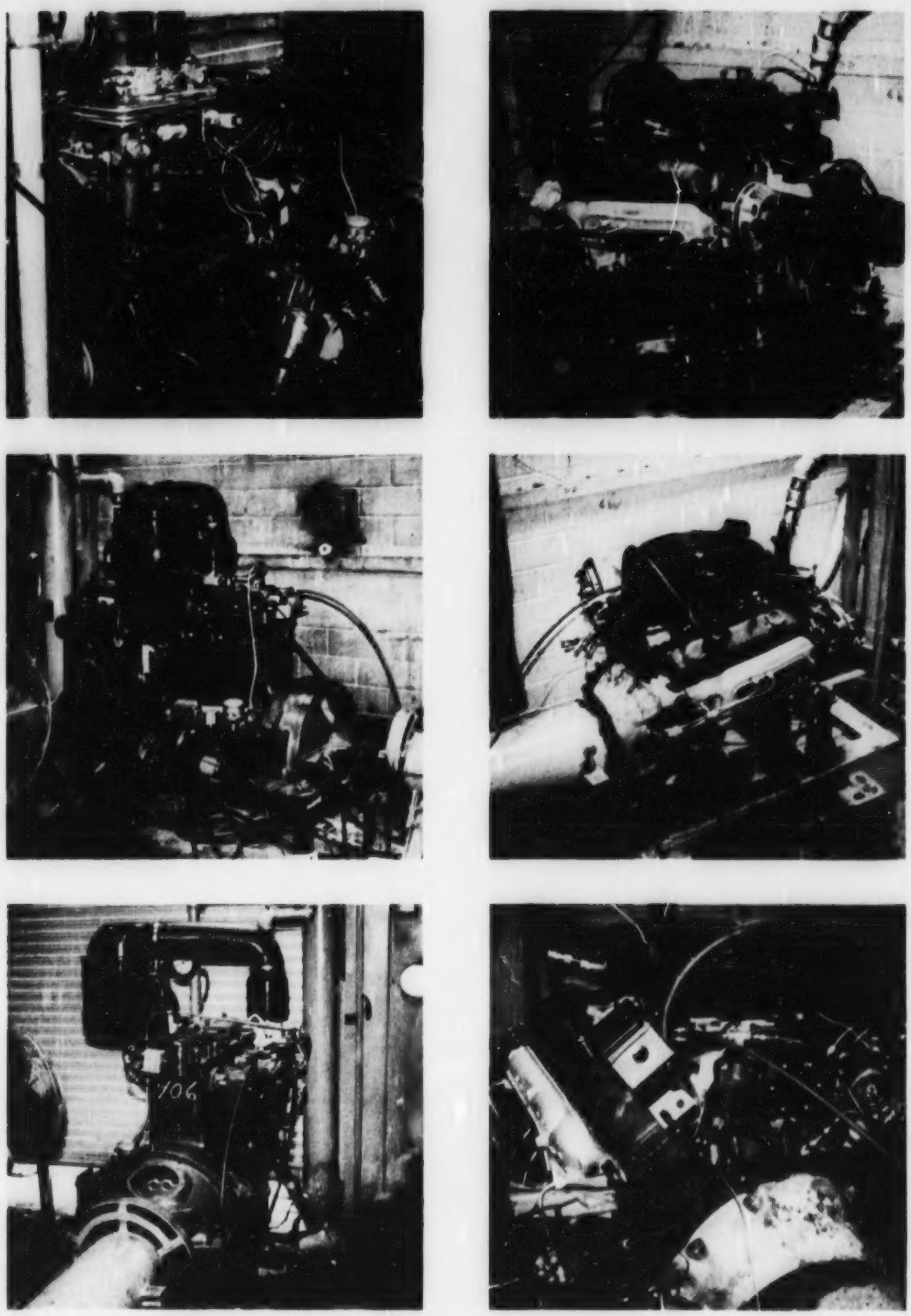


FIGURE 9. ENGINES TESTED ONLY FOR BASELINE EMISSION RATES - STATIONARY OPERATED

primary diesel procedure. Parametric engines, units 6 and 7, were subjected to a more extensive test series than the other engines in keeping with the intent of the project. The alternative gasoline and diesel test methods were employed as needed to either confirm control approaches by different procedures or demonstrate optimization of control to the nine-mode EPA procedure.

Figure 10 contains photographs of several of the engines prepared for stationary test and illustrates some of the hardware, catalysts, EGR valves and systems, air pumps, throttle modulator, etc., that were involved. For example, the upper left photo shows an engine prepared with both reduction and oxidation catalysts while the upper right photo shows an exhaust gas recirculation (EGR) system.

Once the effectiveness of the available control hardware and approaches was determined, a final series of baseline tests by the nine-mode FTP were run and the results expressed in grams per bhp-hour by the 1974 method, and in concentration by the 1970-1973 method. The former served to confirm the stability of the engine during the stationary test phase. The latter was used to determine the extent to which installation of the engine in a truck chassis and subsequent operation on the chassis dynamometer alternative of the nine-mode FTP may have altered the basic engine emissions behavior.

b. Chassis Operated Engines

Once all test plan requirements of the stationary operation were met, the engine was removed and installed in a vehicle, either truck or truck-tractor, that the engine would normally be expected to be used in. Contained in Figure 11 are photographs of several typical engine and exhaust system installations in the trucks for road evaluation. The engines are in their control equipped condition.

The upper left view shows a large EGR valve between the tire and alternator. The upper right view shows an air pump located below the engine due to lack of space in the engine compartment. The two middle views illustrate oxidation catalysts as located and instruments under the truck chassis and frame. The lower right view shows an EGR valve, located between the PCV and carburetor air cleaner.

After operation of several chassis nine-mode FTPs, and comparison to stationary determined concentrations, the truck was prepared for road evaluation. Figure 12 contains photographs of a number of the trucks as readied and in location for the cold start-driveaway course. Note the variety of sizes, shapes, and arrangements of trucks tested and the loading, fifth wheel attachment, etc.

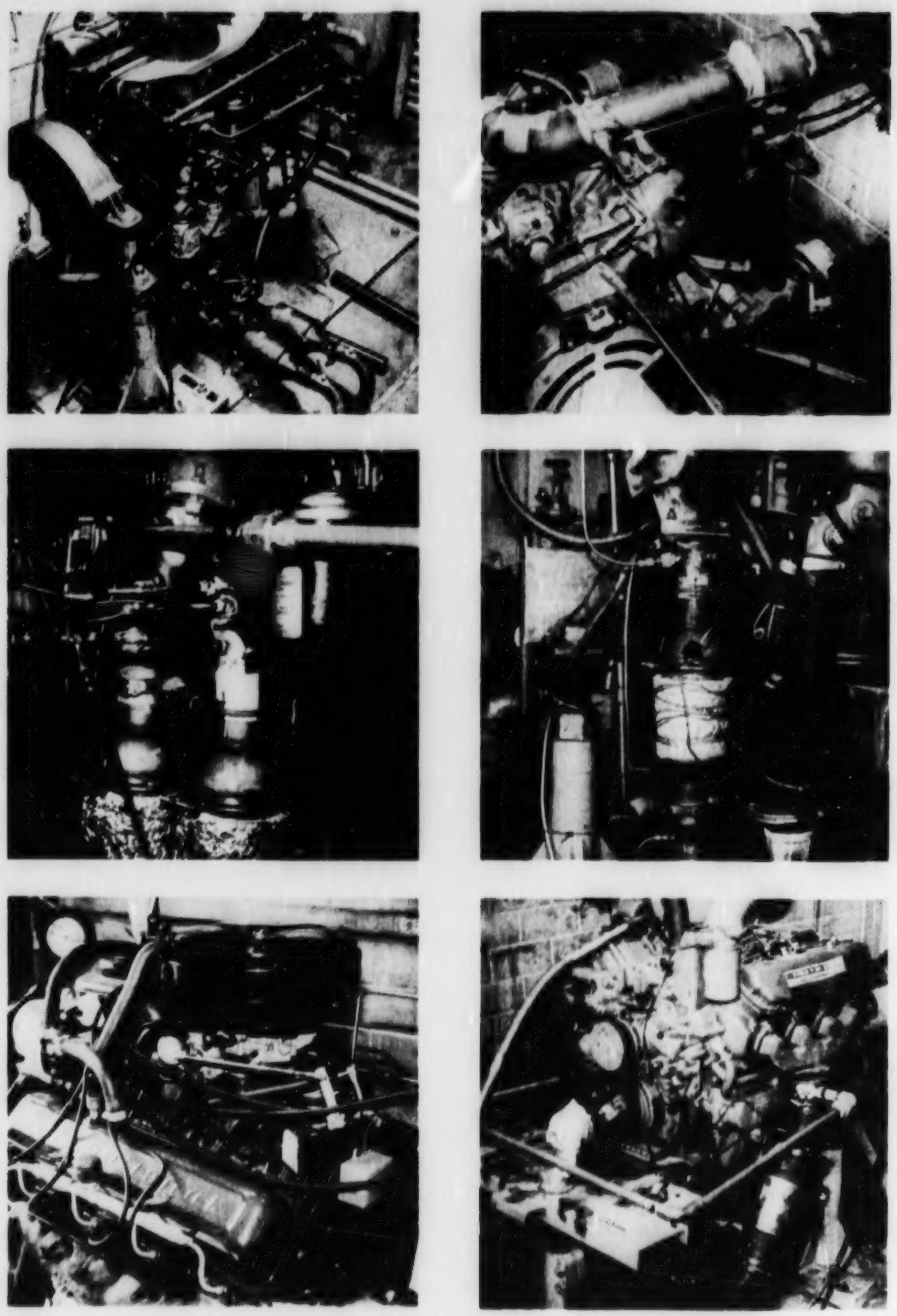


FIGURE 10. CONTROL EQUIPPED ENGINES UNDER STATIONARY TEST

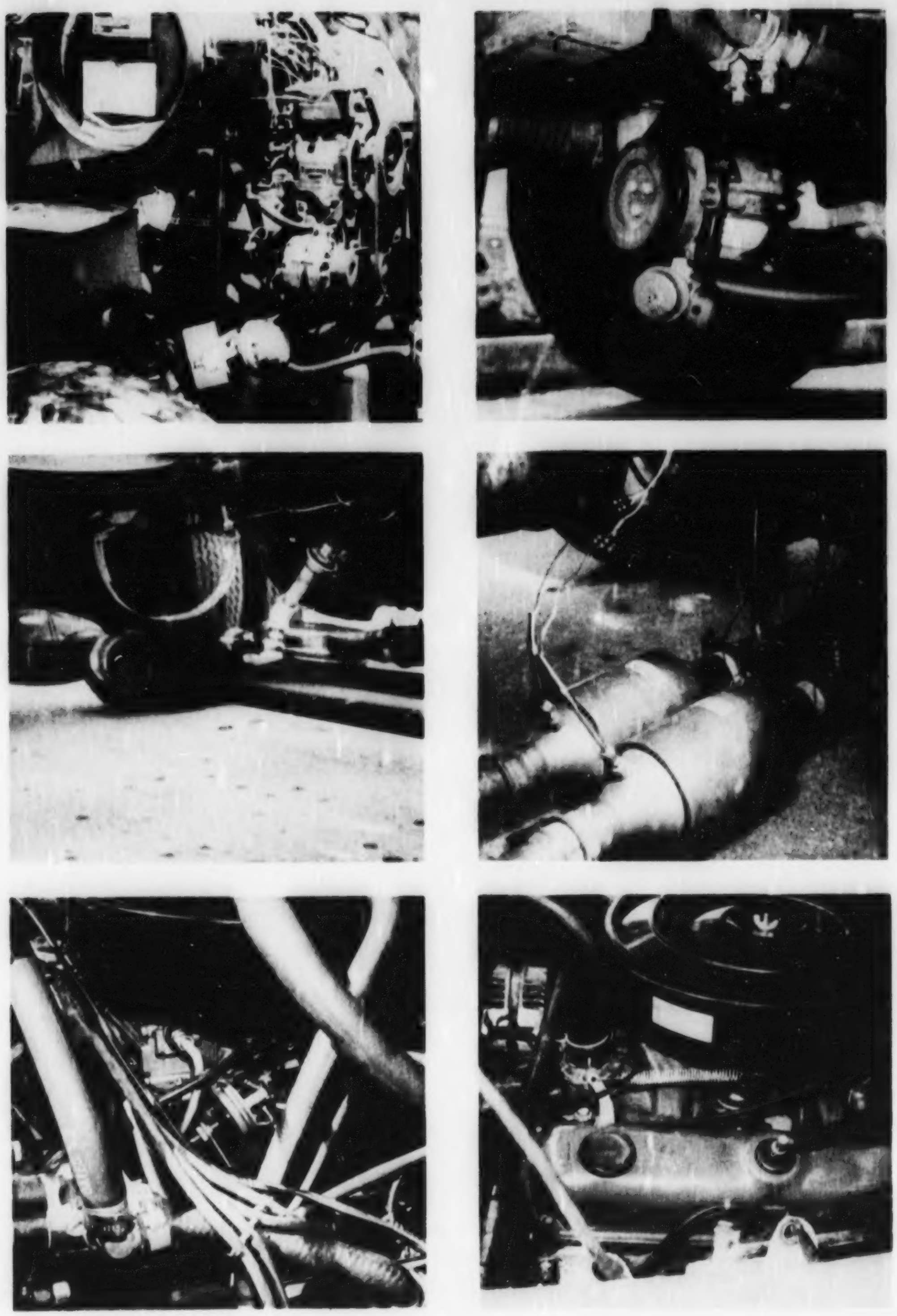


FIGURE 11. CHASSIS INSTALLED CONTROL EQUIPPED ENGINES

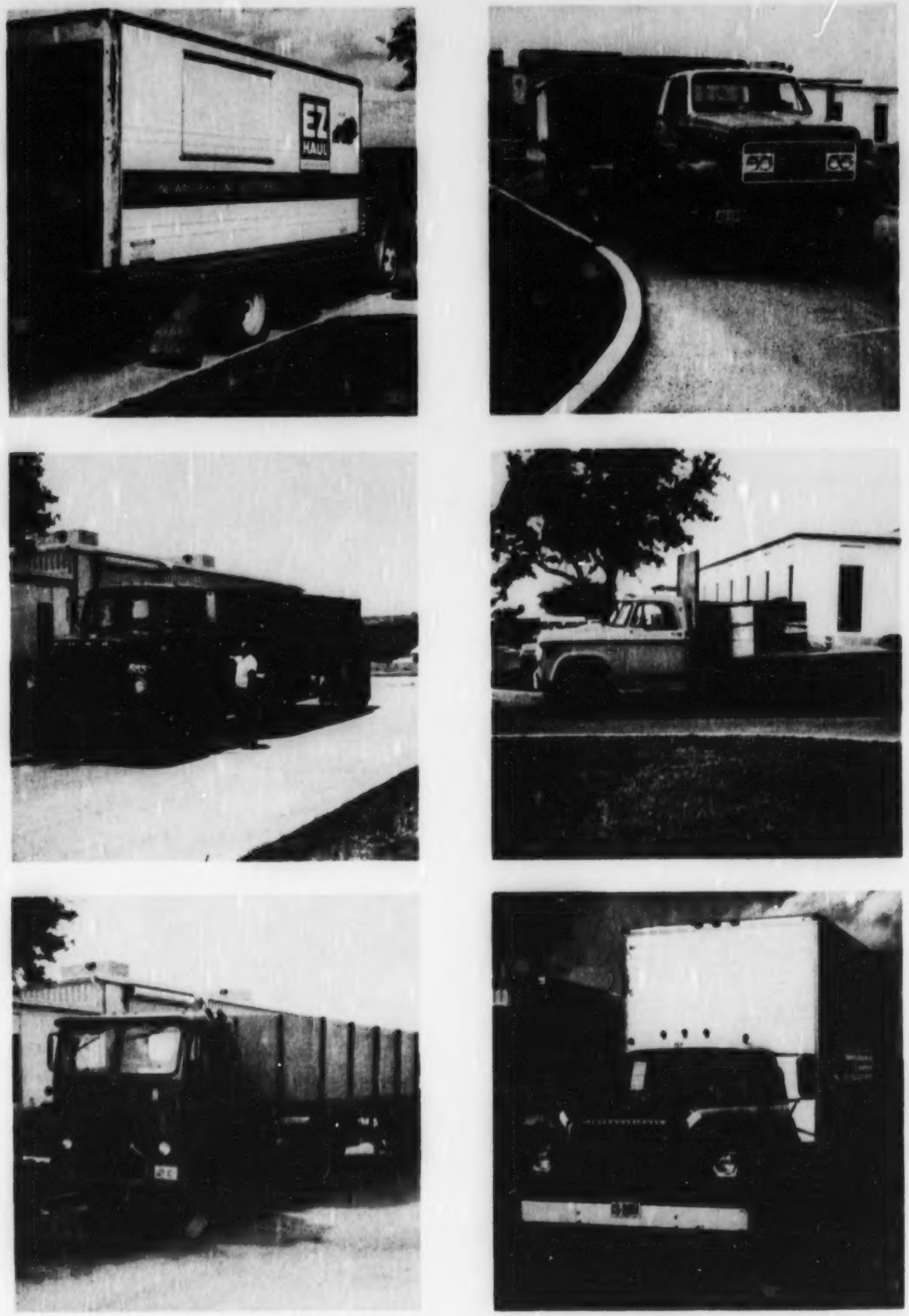


FIGURE 12. TRUCKS PREPARED FOR DRIVEABILITY EVALUATION

The field tests all followed the same work plan. First the vehicle was operated over the cold start-driveaway course twice in succession in baseline or uncontrolled configuration. Next, the warm driveability procedure was conducted followed by acceleration and vehicle performance trials. The engine was then modified to the control configuration determined during the stationary test phase and then retested by the same cold driveaway, warm driveability, and vehicle performance procedures.

In addition, catalyst temperatures were measured over a mostly level portion of roadway. Catalyst outlet or bed temperatures were measured while driving south at 60 mph to a convenient turnaround. Then the temperatures were measured at 50 and then 40 mph on the return. The temperatures were recorded at 10 second intervals for a period of 5 minutes of stable cruise operation. Occasionally, the inlet temperatures were checked to learn more about the catalyst performance under actual driving conditions. For trucks that could not go 60 mph, the speed was dropped to 55 or 50 mph.

The final test series involved replicate operation over the 1975 FTP Light Duty test procedure. Shift patterns and general driveability of the vehicle was established and the road load preset in the dynamometer water brake at 50 mph to duplicate the intake manifold vacuum measured during level road operation (warm driveability procedure). For the diesel, the gross fuel rate was duplicated on the dynamometer to that indicated on the road. The test sequence was to operate from a cold start following the prescribed cold soak period, the complete 1975 FTP during which fuel consumption was measured by weigh scale and distance traveled was measured by calibrated 5th wheel. The engine was then returned to the baseline configuration and two more cold start 1975 FTPs performed. This completed the plan of test for each engine.

I. Emissions Control Hardware

As mentioned in the introduction, the emissions control hardware was furnished through the courtesy of the manufacturer or supplier. A number of items have already been mentioned and shown on engines in previous photographs as EGR and air injection systems, throttle modulator systems, oxidation and reduction type catalysts, among others. Carburetor jets, carburetors, distributors, and other components were employed to complete these systems and make them function properly.

The word system is emphasized since for EGR, for example, to be successful, it must have the proper signal and exhaust flow rate characteristics. It was beyond the scope of this project to invent or otherwise develop the hardware, making the use of available components a requirement. Ingenuity and where possible, extended development of the system were applied to try and optimize the benefits of the system.

Figure 13 contains photographs of some specific control items as installed on various engines. The upper left view shows both an EGR valve (center of photo) and a throttle modulator (right of EGR valve). A dual air pump system is shown in the upper right view. Throttle modulators are shown in the left center and lower photos. The lower left photo also shows three tubes extending from the base of the carburetor. These were used in optimizing the EGR valve opening signal. The right center and lower photos show two different EGR systems, an external add-on valve (center) and an integral valve-intake manifold system (lower).

Figure 14 shows some typical catalyst arrangements in which dual oxidation and dual reduction type catalysts were connected for use on six and eight cylinder type gasoline engines. Six views of the installation of a combined thermal oxidation, reduction catalyst system are shown in Figure 15. Other modifications to the carburetion for air-fuel ratio control, and a supplemental air management system were required. The system, as supplied, was sufficiently complete to allow test by the steady state type nine and 23-mode tests only.

Some of the catalyst manufacturers required a written nondisclosure agreement while others settled for a verbal agreement over the telephone. A sample of the final agreement, after significant compromise between SwRI and one of the manufacturers is enclosed as Appendix M- 5. The provisions in number 8 of this agreement, concerning "no advertising or publicity containing reference to SwRI, etc." should also apply to all data from this project which EPA releases to any of the engine manufacturers or the manufacturers of the emission control devices.

J. Calculational Procedures

All test results were calculated and reduced to required rates or concentrations strictly in accord with the applicable Federal test methods. Some procedures were of an experimental nature and required expansion of the normal print-outs to cover the additional channels of data.

1. 1974 Nine-Mode FTP

This method, described in Reference 8, utilizes the carbon balance method to establish the exhaust mass rate. It is necessary to know precisely the fuel consumption rate as well as CO, CO_2, and HC,

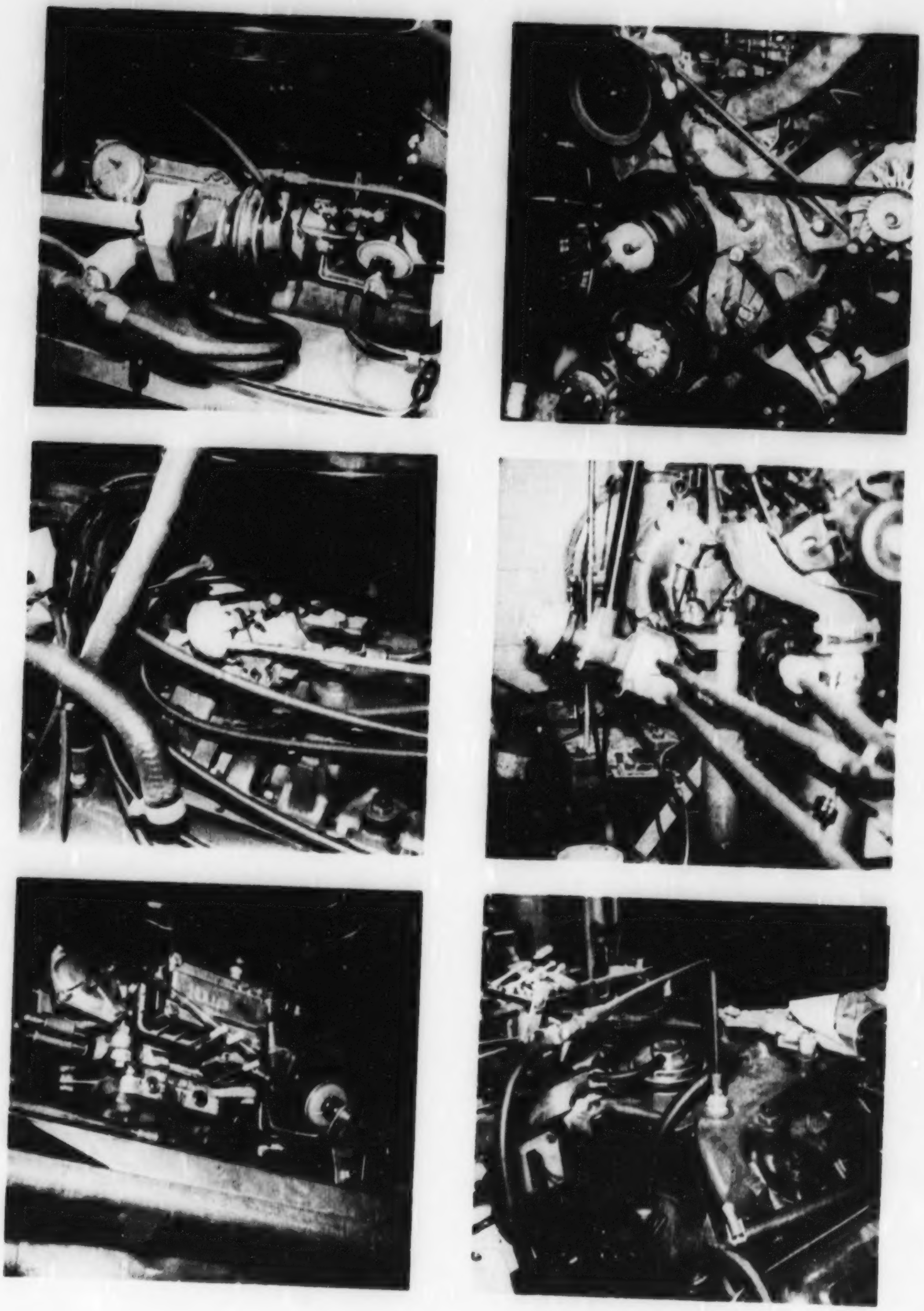


FIGURE 13. ENGINES EQUIPPED WITH EMISSION CONTROL DEVICES

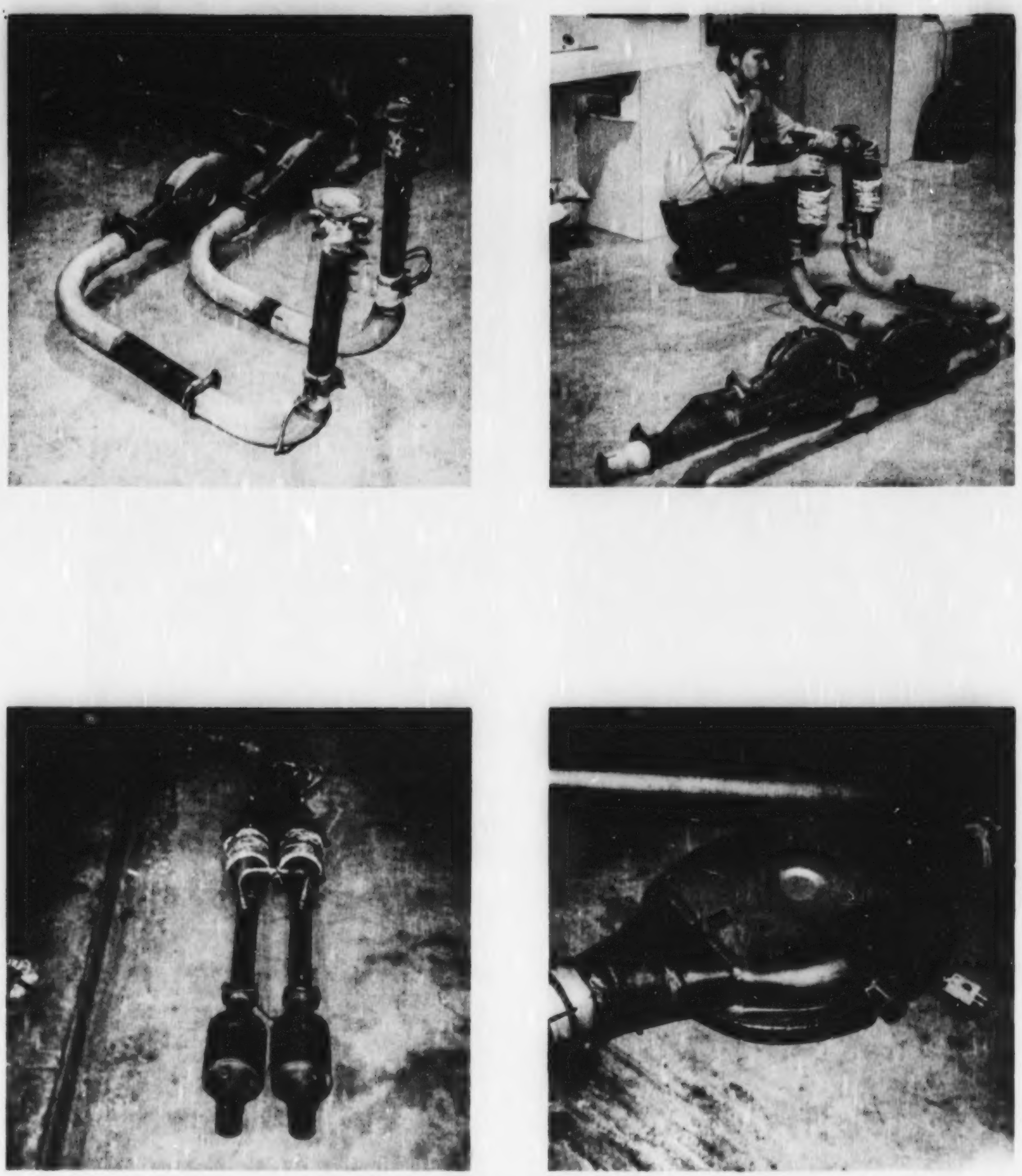


FIGURE 14. REDUCTION-OXIDATION CATALYST ARRANGEMENTS

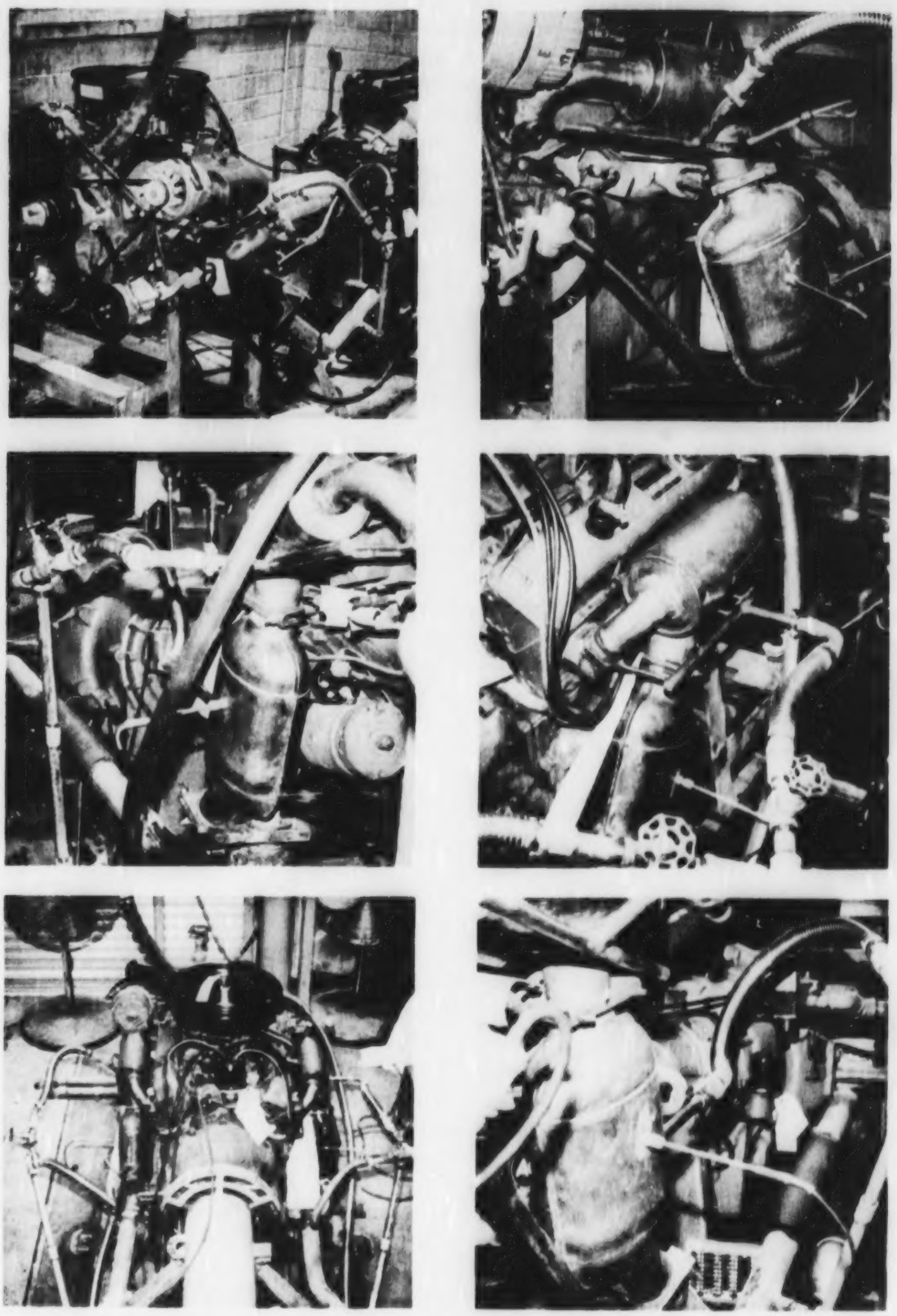


FIGURE 15. REDUCTION-OXIDATION SYSTEM FOR NO_x, HC, AND CO CONTROL

the principal carbon-bearing products of combustion. Since it is desired to express the emission rate on a brake specific basis in terms of grams of contaminant per brake horsepower-hour, it is also necessary to accurately measure or know the power output at the flywheel. With the modal concentrations (raw) from the nine-mode test and the fuel rate and power output modally, the determination of mass rates by the 1974 FTP is a straight-forward calculation. A computer was used and the print-out sheets are explained on Table M-1 of Appendix M.

All data presented in this report use the latest density, correction factor for NO_2 and weighting factors per Reference 9. The correction factor

$$K = 0.634 + 0.00654H - 0.0000222H^2$$

where H is the grains of water per pound of dry air was used to correct observed NO to NO at 75 grains humidity, standard.

Reference 9 also changed the weighting factors from those historically used with the 1970-1973 Federal nine-mode test for weighting the emission concentrations. Because of the importance of weighting factors on the final result, the 1974 weighting factors and the 1970-1973 FTP weighting factors were listed earlier in Table 2.

In essence, the 1974 FTP factors give substantially more weight to closed throttle and idle modes and less weight to the 10-inch and 3-inch modes. Recall that neither the idle or closed throttle are power producing, with the net effect that cycle power is less when weighted making the denominator smaller and the quotient larger.

2. Nine-Mode EPA

This method employed the same computer program and weighting factors as that used for the 1974 nine-mode FTP. The calculational procedure is described by Table M-1. Both the 1974 FTP nine-mode and EPA nine-mode tests included emissions values in terms of FID for HC and NO by CL in addition to HC and NO by NDIR. This resulted in a two-page computer print-out reproduced as a single page in this report. The top half contains the usual brake specific HC, CO and NO_2 and BSFC using all NDIR based measurements. The brake specific emission rates are then recomputed using FID-HC and CL-NO derived values and the NDIR-CO and CO_2 measurements and are summarized on the bottom half of the print-out.

3. 1970-1973 Nine-Mode FTP

The calculations of the final result of ppm n hexane HC, and percent CO followed the nine-mode procedure as specified in detail by the Federal Register(11). In effect, the raw NDIR readings in ppm are adjusted by a dilution factor

$$\text{Dilution Factor} = \frac{14.5}{CO_2\% + 0.5\ (CO\% + 10.8\ HC\ \%\ \text{n hexane})}$$

and then multiplied by the appropriate weighting factor. These were listed earlier in Table 2.

The on-line process computer was normally used with manual strip chart-computer reduction as an alternative. The computer print-out is so arranged to list as-measured raw concentrations, the adjusted, weighted and sum composite values.

Since water vapor or inlet air humidity has a measurable effect on NO formation in combustion engines, this reading is normally presented both on an observed and corrected basis. The conventional correction basis is 75 grains of water per pound of dry air absolute humidity and is determined by multiplying the observed NO by the correction factor

$$\text{Correction Factor (K)} = 0.6272 + 0.00629H - 0.0000176H_2$$

where H = absolute humidity of the air

This expression is identical to that in the current heavy-duty gasoline truck surveillance project (Contract EHS 70-113). The factor came from results of an AMA project described in Reference 13.

4. 23-Mode Experimental Procedure

This experimental procedure and its calculational method was the same as provided by the Project Officer for use in the previous project(6). The calculational methods followed fairly closely those established for the 23-mode procedure used in Reference 5. The method of calculation, using the carbon balance technique, remained the same and all data were expressed on a dry basis. Table M-2 is an explanation of the computer print-out sheets and illustrates how the final grams of HC, CO, or NO_2 were determined from the raw concentrations, fuel rate and power output data. Note that the print-out includes aldehydes, but no aldehyde measurements were made during this project.

The computer print-out includes air-fuel ratio (AFR) by the Spindt calculation method. This necessitated the measurement of O_2 by a Beckman polarographic method. The Spindt Calculation is included in the explanation of the 23-mode computer print-out, Table M-2. For additional description of this method, please refer to Reference 14. The air-fuel ratio computed by this method agrees with the air-fuel ratio calculated by one other method and was felt reliable enough for purposes of this project. All of the calculational methods used in this project were discussed in detail with the Project Officer and his approval obtained for their use. Since a humidity correction factor is not available for obtaining a corrected NO_2 value in the 23-mode test, all NO_2 rates are as observed.

5. 13-Mode Gaseous Diesel Test Procedure

This procedure gives a 20 percent weight to the three idles and an 80 percent weight to the ten speed-load points. A standard SwRI program was used to calculate grams of HC, CO, and NO_2 per bhp-hour from air flow, fuel rate and emission concentrations. The calculational procedure conforms to that given in Reference 9.

6. Diesel Smoke Opacity Factors

The average smoke opacity from the 15 highest-valued one-half second intervals of the two accelerations determine the "a" Factor, and the average opacity from the five highest-valued one-half second intervals of the lugdown mode determines the "b" Factor. The maximum values allowed for "a" and "b" Factors of 1970 through 1973 certification engines are 40- and 20- percent opacity, respectively. For 1974, the "a" Factor was reduced to 20-percent opacity and "b" Factor was reduced to 15-percent opacity. A new peak or "c" Factor, which is the average of the three highest one-half second intervals per cycle and is determined from the "a" and "b" chart readings, was added for 1974. The three cycle "c" values are then averaged to determine the "c" Factor for the test. For more details, please see Reference 9.

7. 1975 Federal Light Duty Procedure

The emission rates of grams of HC, CO, and NO_x per mile were calculated using a standard SwRI computer program developed for this purpose and previously approved by EPA(15). The 7.5 mile driving length for the 23 minute test, as given in Reference 9, was used in these calculations. However, slightly longer or shorter distances were measured due to the performance of the vehicle and its ability or inability to stop during the transient driving schedule.

K. Coding System

As verbally agreed to by the EPA Project Officer, a coding system was used to identify all engines and emission control devices. Coding of some of the catalysts was specifically required by provisions in Non-Disclosure Agreements between Southwest Research Institute and the catalyst manufacturer.

The coding system in use for engines was E-X, where E is a number 1 through 9 which designates the Engine make and displacement and X is 00, 0 or a number 1, 2, 3, etc., which designates the specific configuration - 0 is the primary baseline engine, 00 is the baseline configuration for a different model year, 1, 2, 3, etc., are modified versions of the primary baseline engine. A copy of an engine information sheet for recording detailed information on each engine is enclosed as Appendix M-3.

For emission control devices, the type of control being evaluated (EGR-Air-Cat-Etc.) is given on each computer printout. The specific control unit is given on an Engine Information Sheet which was filled out for each modified version of the primary baseline engine. As an example, assume engine 5 has had a catalyst installed immediately after running the baseline and evaluations are to be conducted on the effect of variation of ignition timing. The engine would be designated as Engine 5-1 and an Engine Information Sheet would fully describe the engine and the catalyst. All computer printouts would indicate that a catalyst was installed and indicate the modified ignition timing (i.e. Cat. - 10° BTDC).

For trucks, the code number of the engine installed was retained. This practice was observed for both controlled and uncontrolled engines when operated in the truck.

III. ENGINE #1 RESULTS (636 CID DIESEL)

This section of the report describes all laboratory and field work with Engine 1.

A. Background

On February 8, 1973, in anticipation of the award of this contract, Mr. Karl Springer met with representatives of the diesel engine manufacturer, Dr. Jose Bascunana and Mr. Jack McFadden of EPA, and Mr. Ralph Fleming of Bureau of Mines at the manufacturer's plant. Rather than continue the test program from where the previous project ended, it was decided to update the engine with low sac type injectors, a new injection pump and to use an automatic shut-off EGR valve preset to close at 88 percent maximum power. It was also decided to use an improved version of the previous metal honeycomb monolith catalyst instead of that used previously by Bureau of Mines under EPA-IAG-0129D.

In summary of this meeting, the following adjustments and configuration were used in coordination with the durability test by the Bureau of Mines on a similar engine. The standard or baseline configuration was defined as 16° BTDC static timing with pump incorporating new style hydraulic governor and with new style low sac injectors. The control equipped engine was defined as the same engine as the baseline or standard with static timing set to 13° BTDC (3° retard) and with an advanced version of the oxidation catalyst. Also, the control equipped engine incorporated exhaust gas recirculation set to return 10 percent hot exhaust at 3/4 power at 2800 rpm. The EGR rate will then vary slightly as a function of engine speed and engine load, since this is a naturally aspirated engine. The revised injection pump incorporated a cut-out switch that closed the EGR valve at 88 to 90 percent of max power and thereby prevented EGR during max and near max power. Basic settings for both the baseline engine, designated Engine 1-0, and control equipped engine, coded Engine 1-1, were

Rated speed - 2800 rpm
Intermediate speed - 1700 rpm
Exhaust Restriction - 34 inches H_2O at 2800 rpm, max power
Intake Restriction - 25 inches H_2O at 2800 rpm, max power
Maximum Intake Air Temp - 130°F with EGR

B. Engine Preparations

Engine 1-1 featured a laboratory type EGR system that obtained exhaust from the exhaust outlet of each bank of the engine immediately after the exhaust manifold flange but just prior to the oxidation catalyst which was closely connected. The exhaust recirculated passed through a thin plate orifice of 17/32 inch ID located at the exhaust pipe and then traveled through an 8 ft length of 1 1/8 inch diameter, hard drawn copper tubing. This length was selected to allow cooling of the EGR before entry into the air intake. A turbocharger waste gate valve was employed to act as an automatic cut-off valve to stop EGR at maximum power and thereby prevent a derating effect and smoke penalty. The waste gate valve was set to close at 90 percent power by a torque spring in the fuel pump. The recirculated exhaust after passing through the valve then entered a special mixing section to promote the fairly hot exhaust to mix adequately with the fresh air intake before entering the combustion chamber.

The EGR system was designed and calibrated to give a ten percent EGR rate defined as

$$\%\ \mathrm{EGR} = \left(\frac{\mathrm{CO_2\ intake - CO_2\ air}}{\mathrm{CO_2\ exh = CO_2\ air}}\right)\left(\frac{\mathrm{CO_2\ exh + 100}}{\mathrm{CO_2\ intake + 100}}\right) \mathrm{X}\ 100\%$$

The first term is the dilution term while the second term corrects the measured CO_2 values for water vapor. The EGR system was specified to achieve a nominal 10 percent rate at 75 percent of maximum power at rated (2800 rpm) speed. Prior to these adjustments, the intake restriction was set at 34 inches of water at maximum power and rated speed. The actual rate achieved was 9.87 percent. The inlet and exhaust restrictions were as specified by the manufacturer as maximum for the 13-mode FTP. The rate of EGR was allowed to vary at other loads and speeds.

C. Stationary Operated Results

Stationary operation involved the 13-mode FTP and an experimental 23-mode procedure. In all cases, the run-to-run repeatability of the results are termed excellent for this mid-range engine.

1. 13-Mode FTP

Table 4 lists the cycle composite results for Engines 1-0 and 1-1. Comparing the average levels before and after control, CO, HC, NO_2, and $HC+NO_2$ emissions were all reduced substantially, CO by 87 percent, HC by 82 percent, NO_2 by 44 percent, and $HC+NO_2$ by 50 percent. Compared to California and Federal Limits, shown at the bottom of Table 4, the $HC+NO_2$ for Engine 1-0 was already within the 16 gram Federal limit for 1974 and the 10 gram California limit for 1975.

The cycle weighted brake specific fuel consumption (BSFC), Table 4, showed consistently higher fuel BSFC for the controlled engine, about a 4 percent increase (0.430 vs. 0.412 lbs fuel per bhp-hr weighted)

TABLE 4. ENGINE 1, 13 MODE FTP EMISSIONS SUMMARY

Test No.	Run No.	Date Run	Emissions, Grams/Bhp-hr CO	HC	NO_2	$HC+NO_2$	BSFC Cycle
Engine 1-0, 16°BTC, Low Sac Injectors							
1	1	5-23-73	4.69	1.40	8.16	9.56	0.409
1	2	5-23-73	4.98	1.35	8.20	9.55	0.412
1	3	5-24-73	4.79	1.36	7.66	9.02	0.415
		Average	4.82	1.37	8.01	9.38	0.412
Engine 1-1, 13°BTC, Low Sac, Oxidation Catalyst, EGR							
2	1	5-25-73	0.66	0.26	4.57	4.83	0.424
2	2	5-25-73	0.61	0.24	4.56	4.80	0.438
2	3	5-25-73	0.66	0.24	4.17	4.41	0.426
		Average	0.64	0.25	4.43	4.68	0.429
Percent Reduction*			87	82	44	50	4 Increase
1973 California Limits			40	-	-	16	
1974 Federal Limits			40	-	-	16	
1975 California Limits**			30	-	-	10	

$$*\frac{\text{Engine 1-0 - Engine 1-1}}{\text{Engine 1-0}} \times 100\%$$

**As of November 20, 1973

for the emission controlled engine. Power was not degraded by the EGR or the catalysts, but retarding the injection timing had the apparent effect of reducing maximum observed (uncorrected) power output from an average of 213 to 208 obs Bhp at 2800 rpm and from an average of 153 to 150 Bhp at 1700 rpm or about 2 percent. Engine smoothness and other operational items were quite normal. Tables A-1 through A-6, in Appendix A, show the modal and composite emission rates for this test series.

2. 23-Mode Experimental Procedure

The experimental 23-mode test showed much the same emission trends and improvements as did Engine 1-0 and 1-1 when expressed by the 13-mode FTP. Table 5 indicates essentially the same type of emission reductions and the brake specific HC, CO and NO_x levels, using the fifteen modes of the 23-mode procedure, to have almost the same magnitude as the 13-mode test. This is not surprising in view of previous experience with diesel engine emissions behavior and the various engine exercise type schedules employed.

TABLE 5. ENGINE 1 EXPERIMENTAL 23 MODE EMISSIONS SUMMARY

Test No.	Run No.	Date Run	Emissions, Grams/Bhp-hr CO	HC	NO_2	$HC+NO_2$	Weighted BSFC
		Engine 1-0, 16°BTC, Low Sac Injectors					
1	1	5-23-73	4.73	1.47	8.22	9.69	0.415
1	2	5-23-73	5.15	1.44	8.53	9.97	0.413
1	3	5-24-73	4.88	1.45	7.54	9.00	0.415
		Average	4.92	1.45	8.10	9.55	0.414
		Engine 1-1, 13°BTC, Low Sac, Oxidation Catalyst, EGR					
2	1	5-25-73	0.95	0.40	4.30	4.70	0.426
2	2	5-25-73	0.88	0.39	4.33	4.72	0.429
2	3	5-25-73	0.94	0.41	3.90	4.30	0.427
		Average	0.92	0.40	4.19	4.57	0.427
Percent Reduction*			81	73	48	52	3 Increase

$$^{*}\frac{\text{Engine 1-0 - Engine 1-1}}{\text{Engine 1-0}} \times 100\%$$

It is worthwhile to note the essentially zero emission rates found during closed throttle (rack) motoring of the engine (Modes 12 and 23) in the Appendix Table A7 through A12. HC values were typically less than 50 at 1700 rpm and less than 100 ppmC at 2800 rpm on Engine 1-0. HC during the closed throttle was substantially lower than all other conditions with the exception of maximum power, 2800 rpm where they were equal. CO and NO_x are not worth measuring under closed throttle, since all that exists in the exhaust is some oil vapors and drips of fuel from possible leaks or a malfunctioning injector. For the expense and trouble of running the closed throttle, the end results hardly seem justified. The catalyst seemed to have some effect on the HC either because of sufficient residual temperature from previous modes or possibly as a HC trap for the very oily, heavy or high molecular weight compounds such as might represent crankcase lubricating oil.

The weighted BSFC for the 23-mode cycle showed essentially the same trend as the 13-mode FTP, namely about a 3 percent increase in fuel consumption (0.427 vs 0.414 lbs fuel per bhp hr) for the controlled vs. the uncontrolled engine. Power output differences were the same as noted for the 13-mode test since the 13-mode results were calculated from the experimental 23-mode cycle. The Calculations used measurement by chemiluminescent (CL) type analyzer operated in the NO_x configuration instead of the NO non-dispersive infrared (NDIR) required by the 13-mode FTP. Both instruments were run simultaneously.

3. Federal Smoke Test

The final set of stationary dynamometer experiments with Engine 1 were duplicate smoke tests by the Federal Smoke Test procedure and by a routine max power-smoke curve at 2800 to 1600 rpm in 200 rpm increments. Both uncontrolled or baseline, Engine 1-0, and the emissions controlled Engine 1-1 were operated with the results shown in Table 6.

TABLE 6. FEDERAL SMOKE TEST AVERAGE RESULTS - ENGINE 1

	Smoke, Percent Opacity		
Configuration	"a" Factor	"b" Factor	"c" Factor
Engine 1-0	8.9	10.3	13.6
Engine 1-1	9.8	11.3	13.9
Difference	+0.9	+1.0	+0.3
Federal 1970	40	20	-
1974	20	15	50

Engine 1-0 and 1-1 resulted in essentially identical smoke with the controlled engine exhibiting slightly more smoke, about 1 percent opacity during the acceleration "a" and lug-down "b" factors. This represents about a 10 percent increase in smoke with the control equipped engine.

To place the measured levels in perspective, 3 to 4 percent opacity by the EPA (PHS) full flow, light extinction smokemeter is at the limit of visibility with 10 percent opacity termed a light-moderate smoke level. The slight difference, though quite consistent and considered real, is probably attributed to the 3 degree retard in static injection timing though this is not certain.

A full power curve was run on the engine with differences in smoke between the two engine configurations of about 1 percent opacity as found during the lug-down part of the Federal Smoke Test. Less power was observed from the controlled engine, Engine 1-1 relative to Engine 1-0, the uncontrolled engine, as was the case mentioned during the gaseous emissions tests. Power differences (losses) of about 4 percent were attributed to the retarded timing of the engine. EGR was not operative since the maximum power runs were at 100 percent power and the EGR system of Engine 1-1 cuts out at 90 percent power.

One part power curve at 75 percent maximum power was made with Engine 1-1 to explore the effect of EGR operation on engine smoke tendencies. The results, listed on Appendix Table A-17, show that at 2800 rpm, 13.5 percent opacity was noted as compared to 12 percent for the same controlled engine operated at 100 percent power. Ten percent opacity was noted at 2600 rpm and 75 percent power versus 10.8 percent opacity at full power. At speeds below 2600, the smoke at 75 percent power decreased steadily to one-third that at max power. It is likely that the smoke could increase beyond the 13.5 percent found at 75 percent load because of the deleterious effect of EGR on air-fuel ratio as power increases.

Since measurement of smoke at steady state conditions just on each side of the 90-91 percent power point where EGR is either on or off was not done during the stationary dynamometer phase, a brief series of tests were made during the chassis runs. The results of these tests made on the chassis dynamometer, also shown on Table A-17, indicate that just below the set point power level, the smoke opacity is greater than just above the point. This effect was found to be more pronounced at the highest engine speeds.

For example, at 2700 rpm, the smoke was 11 percent opacity at 142 hp at the rear wheels and the EGR system was inoperative or "off" and the smoke was 16.5 percent at 139 hp, just below the on-off EGR point, at 140 hp, the system was alternated between on and off, it could not decide which, and a fluctuating smoke level was observed that varied from 9 to 14 percent opacity.

The waste gate, normally used on a turbocharger, employed as an off-on valve was quite satisfactory for this series of experiments. A modulating type system will be necessary, however, to limit the abrupt nature of the transition on smoke performance, especially at higher speeds. This should be fairly straightforward to do if EGR is to be used as an NO_x emission control method on diesel engines. For additional, more detailed, results from the Federal Smoke Tests and the maximum and part load power smoke performance, please refer to Tables A-13 through A-17.

D. Road Evaluation

The engine was installed in a conventional 2 axle 1970 Ford Tractor License J 29721 (Texas), Unit 885, Vehicle No. R804 VH50029 with nameplate empty weight of 9500 lbs and a gross tractor capacity of 28,500 lbs. The tractor was equipped with a 5 speed forward transmission and single speed rear axle with 10.00-20 size tires. The normal trailer used with this tractor in city delivery, urban-suburban service, has dual 10.00-20 (alternative of 9.00-20) size tires on a single rear trailer axle. This makes up a fairly manuverable 3 axle tractor-semi trailer rig which is fairly common.

Texas, like much of the United States, allows a maximum weight of 18,000 lbs for single drive or trailer axle with dual 10.00-20 tires, and approximately 9,000 lbs on a front axle with the same size tires. In actual practice, it is extremely difficult to reach this level on the front axle because of load distribution, steering, etc.

Given that the drive axle and the trailer axle can each handle 18,000 lbs and the front axle can handle 9,000 lbs for a total of 45,000 lbs, then the test weight is computed as half the difference between the GCW (gross combined weight) or 45,000 lbs and the empty weight of the tractor-trailer combination of 15,930 lbs added to the empty weight. Accordingly, the test weight on a half payload basis was 30,465 lbs.

1. Cold Start - Driveaway

The vehicle performed satisfactorily in both baseline and with the controlled engine configurations throughout all facets of this portion of the driveability testing. During the practice run, it was found that by operating in 2nd, 3rd and 4th gears, the test course could be safely and successfully driven. The accels in steps 11, 14, 16, 19 and the following decels in steps 12, 15, 17 and 20 were made to 40 mph instead of the nominal 35 mph listed in the procedure, Appendix M-6. This allowed the truck to operate more normally and utilize the engine-transmission and drive line properly.

Both versions of the engine started properly and accelerated, cruised and decelerated with only good quality driveability observed. Since the tractor is equipped with air brakes, the initial cold start idle period was extended from the 53 seconds in the procedure to two minutes for Engine 1-0 and to three minutes for Engine 1-1. This was the idle time (low idle) required to build sufficient air pressure for safe tractor-trailer operation. During the start of engine 1-0, the baseline configuration, the engine stalled once during step 1. No stalls occurred with engine 1-1. Idle speed on first start would be about 450 rpm and then increase to the 525-550 rpm range before the first accel from rest.

No stumbles or hesitation were evident during accels either at part throttle (PT) or wide open throttle (WOT) from rest (0-25 mph) or in fourth gear (25-40 mph). During cruise, no stretchiness, hesitation or surge was found in either control configuration. Deceleration was smooth and quiet with no backfiring, popping or other exhaust noises. In summary, the application of the control items to Engine 1 did not noticeably deteriorate or otherwise alter the good cold start-driveaway performance of this tractor-trailer rig.

2. Warm Driveability

This procedure required about three hours to perform and was intended to ferret out the quality of vehicle driving under everyday vehicle operating conditions. The procedure supplements the cold start in that it is more extensive. Step 2 of the procedure, described in Appendix M-6, involved the measurement of a variable that indicates level road load as well as the assessment of vehicle driveability at constant cruise speeds of 20, 30, 40, 50 and 60 mph.

For engine 1, intake manifold vacuum is not an indicator of engine power setting, as it is on the other engines although fuel rate is. A method by which the gross fuel supplied to the engine could be continually monitored, using a glass type variable area flow meter, was described earlier and was used successfully on the road with reliable, repeatable results. This average reading, at 50 mph, was then used to set the road load for the 1975 FTP chassis dynamometer tests to be described in a later section.

As in the case of the cold start driveability evaluation, there were no apparent driveability problems with either Engine 1-0 or 1-1. The cruise operation was found to be equivalent with no hesitant, stretchy type operation or surge noted. Except for the 60 mph operation which was at maximum power and slightly over rated speed, the engine operated at or below the 90 percent power level so that EGR was always occurring. A signal light was mounted on the dash to indicate when the EGR system was operating. Also, it was not possible to find a consistent difference in cruise gross fuel rate regardless of whether the engine was control equipped or not. There may be a real difference but it could not be detected during the cruise type of field checks made.

It did not seem to matter whether the throttle was opened slowly or rapidly, at a light, moderate, or heavy crowd in the accels from a stable 25 mph cruise to 35 mph (Steps 3, 5, 13, 15, and 17). Part throttle accels at 1/4, 1/2, and 3/4 opening (Steps 7, 9, and 11) resulted in equally satisfactory operation. In no case did either engine configuration hesitate, stumble or stall. Engine response to part throttle openings (tip-in) at 25 and 35 mph (steps 19 and 20) were likewise quick, less than one second, and firm with no jerk or delay that could be measured. It did not matter how the engine-vehicle decelerated, whether from high or low speed or at closed or part throttle, no backfiring or exhaust noises were evident.

The engine idle quality was equally good after initial warm-up (step 1) and after repeated maximum acceleration from 0 to 60 mph. There was no after-run or prolonged engine shut-down, just a key-off normal-engine rpm decrease. In summary of the warm driveability assessment, both engine configurations produced equivalent drive quality that was not only satisfactory according to the rating scale, but adjudged to be good. Although the engine was set to recirculate 10 percent ex[illegible] power demands of 90 percent and less, no stretchy, hesitant typ[illegible]ation, generally associated with carbureted gasoline engines, could be discerned. This was checked and rechecked at various cruise and part throttle accelerations where if it would occur, it would most easily be noticed.

3. Vehicle Performance

In preparing the vehicle-engine for the road testing phase of the project, cold and warm driveability, etc., the inlet and exhaust restrictions utilized in the stationary testing phase were employed. The same 25 inch H_2O inlet restriction was imposed as was the exhaust restriction of 34 inches of water at rated speed and load. The baseline engine was run with these restrictions but with stock, conventional muffler and exhaust system while the controlled engine, 1-1, was equipped with the same exhaust components, catalysts in each bank and cross-over as used earlier. No muffler was used in the stationary test of Engine 1-1 and no muffler was used in its field test. The exhaust noise level was noticeably higher but was not so high to preclude field testing.

In our practice running with the baseline engine and stock inlet and exhaust, the engine seemed to perform better than when the restrictions were set. Recall that these restrictions were originally intended to represent the worst case (they are the manufacturer's maximum allowable) for smoke production and were originally included in the Federal Smoke Test procedure. The gaseous emissions 13-mode test then utilized these restrictions without change since the tests are done concurrently and both smoke and gaseous emissions utilize a common durability schedule.

As many manufacturers have found, so have we, that these restrictions are not normal and seem extreme. In the case of Engine 1, they were two to three times normal for this vehicle. Be that as it may, vehicle performance was run with these type restrictions even though abnormal. To do otherwise would have jeopardized the EGR rate adjustment which was made under the same inlet-exhaust restrictions.

A series of accelerations from 0-20, 0-40, 0-60, and 20-50 mph both ways over a level road course were made at wide open throttle.

The EGR system was not operating for most of these runs, only during the initial accel and during upshifts. Differences in performance must be attributed to the change in timing with Engine 1-1 (13°BTC) versus the 16° BTC static setting of Engine 1-0. The air temperature was about 5 degrees hotter 85 versus 80 when Engine 1-1 was tested with the barometric pressure about the same. The weather was about the same with slightly more wind, 10 mph for Engine 1-1 versus 3 to 5 mph for Engine 1-0.

The average times and distances are listed below.

			mph accels			
Engine	**Configuration**		**0-20**	**0-40**	**0-60**	**20-50**
1-0	Baseline	Time, sec	10.1	33.6	92.2	41.2
		Dist., miles	0.037	0.238	1.062	0.437
1-1	Controlled	Time, sec	10.2	35.1	101.3	44.2
		Dist., miles	0.037	0.250	1.203	0.466

Although the 0-20 accel times are quite close as expected, the 0-40, 0-60, and 20-50 mph accelerations, all made mostly at WOT where EGR was inoperative, were consistently higher with the controlled engine. The 0-40 mph time and distance were about five percent longer with Engine 1-1. The 0-60 mph time and distance were on the order of ten percent greater with Engine 1-1. The 20-50 mph accel time and distance was about seven percent higher with the controlled engine. Since EGR was mostly inoperative during these maximum accelerations, the only major factor that could have affected the performance was the 3° retarded basic timing with the controlled configuration.

The stationary dynamometer results indicated a WOT power loss, that could be attributed to the timing change of about 4 or so percent. In field operation, this could account for most of the performance loss under transient conditions. The closed throttle 50 to 20 mph deceleration time was an average of 52.3 seconds and 0.485 miles. These coast downs in 5th gear were essentially the same for both engine configurations.

To examine further the vehicle's ability to perform, the grade operation sequence was run in duplicate. This is a 1.075 mile course that is level for about the first 0.75 miles and finishes steep uphill at a constant grade for about 0.25 miles. The vehicle is accelerated from rest to its maximum speed with intent to get to the top of the hill as quickly as possible. The following are average times, distances and speeds attained.

Engine	Configuration	Distance, miles	Max speeds, mph		Time Required, seconds
			Flat	Crest	
1-0	Baseline	1.068	54	42	96.4
1-1	Controlled	1.067	53	40	100.

Note that the time was higher and max speed lower for Engine 1-1 than for the baseline Engine 1-0. This was a maximum, all-out, performance test. A top speed of 54 mph on the flat and a maximum speed of 42 mph was recorded at the crest of the hill (end of test course). The control equipped engine negotiated the course in 100 seconds total while the baseline engine required 96.4 seconds, about 4 percent less. In running the course, the top speed on the flat was 53 mph with 40 mph noted at the top of the hill. This is about 5 percent slower and is attributed mostly to the timing change (retard) with Engine 1-1.

The major conclusion of these performance tests was that Engine 1-1, probably due to the retarded timing, from 16 to 13 degrees BTC, gave slightly poorer performance in terms of the time and distance to accelerate from 0-40, 0-60, and 20-50 mph. The time and distance percent reductions ranged from 4 to 10 percent, the worst case being 0-60 mph. With the baseline engine, 60 mph was achieved fairly readily with a very small margin of power. With the control equipped engine, the attainment of 60 mph was difficult to accomplish, there being little or no reserve left. Throughout the performance runs, driveability continued to be quite satisfactory with both engine configurations.

4. Catalyst Temperatures

The fourth portion of the road test procedure involved operating the catalytic muffler equipped truck for 5 minutes at 60, 50, and 40 mph in 5th while recording the catalyst outlet temperatures from each reactor on 10 second intervals. These temperatures are summarized on Table 7 and the max, min, and arithmetic average value indicated at the bottom. Occasionally the before temperatures were checked and found to be substantially lower than the outlet temperature. Normally, the difference was 50 to 200 degrees F and averages on spot checks were about 100°F. The average road outlet temperatures, shown in Table 7, were quite similar to that found in the stationary dynamometer operation. At no time during any of the road operation did the catalyst outlet temperatures exceed 1100 degrees F. Catalyst temperatures were monitored during the cold and warm driveability as well as during the acceleration performance trials.

TABLE 7. CHASSIS OPERATED ENGINE 1-1
CATALYST OUTLET TEMPERATURES 5TH GEAR

	60 mph Cruise		50 mph Cruise		40 mph Cruise	
Min:Sec	Left	Right	Left	Right	Left	Right
			After Catalyst			
0:0	1090	1060	950	950	650	660
0:10	1100	1080	980	980	640	640
0:20	1100	1080	980	980	620	620
0:30	1100	1080	980	980	660	620
0:40	1080	1060	960	980	660	600
0:50	1100	1080	940	960	600	600
1:00	1100	1080	920	940	600	600
1:10	1100	1080	920	920	580	580
1:20	1100	1080	920	920	580	580
1:30	1080	1060	920	930	580	580
1:40	1060	1040	920	920	560	560
1:50	1030	1020	900	920	560	560
2:00	1030	1030	860	870	560	560
2:10	1050	1040	840	850	560	560
2:20	1060	1050	820	840	560	560
2:30	1050	1040	800	810	560	560
2:40	1040	1040	800	850	560	560
2:50	1020	1020	840	850	580	570
3:00	1020	1020	880	880	580	580
3:10	980	970	920	900	570	570
3:20	970	920	920	920	590	590
3:30	920	960	950	950	560	560
3:40	980	960	950	950	580	580
3:50	980	960	900	920	580	580
4:00	1010	1000	880	890	580	580
4:10	1020	1010	840	850	580	580
4:20	1040	1020	800	800	580	580
4:30	1050	1030	860	800	600	600
4:40	1040	1040	780	780	590	590
4:50	1020	1020	760	760	590	590
5:00	1040	1040	800	800	600	590
Max	1100	1080	980	980	650	660
Min	920	960	760	760	560	560
Avg	1077	1029	875	861	585	585
			Before Catalyst			
Max	950	840	840	800	540	540
Min	840	700	620	580	560	560
Avg	894	773	751	691	545	547

E. Chassis Dynamometer Studies

The final tests made with Engine 1 installed in the truck tractor was a series of modified 1975 FTP light duty runs following as closely as possible the LA-4 driving schedule. This is the first time a truck tractor operating on distillate fuel has been tried on this procedure and required some slight changes to the procedure normally intended for light duty cars and trucks below 6000 lbs GVW.

The basis for the road load and inertia test weights has been discussed earlier. Using the field determined road gross fuel rate indication, the dynamometer was adjusted to absorb 95 hp from the rear wheels at 50 mph, 5th gear, 2370 rpm engine speed. To see if this power setting seemed reasonable, the vehicle was then accelerated at WOT to achieve a maximum speed of 59 mph, very similar to that achieved during the field performance tests. This tended to validate the horsepower setting and indicated that it was not particularly low or high.

A nominal 25,000 lbs inertia simulation was employed as these were the two wheel combinations available for a single drive axle tractor. During the practice run, it was found that the pre-marked shift points on the driver aid strip chart was a satisfactory shift pattern; namely, start off from rest in second, upshift to third at 15 mph, upshift to fourth at 25 mph and upshift to fifth at 40 mph. The engine speed range and driveline matching made the recommended shift points acceptable for this specific tractor.

Also during the practice run, the engine inlet and exhaust restrictions were rechecked and adjusted to specifications with the CVS in operation. Also, the influence of the CVS on engine restriction was checked to assure the CVS at the nominal 600 CFM could handle the exhaust volume produced during the LA-4 . It was found to be well within the ± 0.5 in H_2O variation from atmospheric pressure specified. The CVS blower inlet temperature reached a peak of 160°F during the 0-56 mph acceleration but dropped back to run around 145°F for the test as an average. This temperature was recorded throughout the test on a strip chart, averaged, and used in the blower mass rate calculation.

The results of the duplicate runs are summarized in Table 8 and the individual run computer sheets are included as Tables A-18 through A-21 for additional detail. Although the truck traveled further than the nominal 7.5 miles for the complete 23 minute LA-4, the emission rates are calculated on the basis of 7.5 miles (per Federal Register). The fuel consumptions are also based on 7.5 miles. The difficulty in stopping the vehicle made the indicated miles traveled greater than 7.5, i.e., an average of 8.074 for control equipped and 8.167 miles baseline. The clutch was disengaged to give the normal idle with most of the time at rest, zero mph, used to stop the vehicle.

Sometimes the vehicle could not be stopped before start of the next acceleration depending on the time specified for the zero mph and rate of decel specified. The first 505 seconds for the third bag gave average indicated distances of 3.668 (controlled engine) and 3.761 (baseline) which, when adjusted to a 7.5 mile 23 minute distance, are 3.407 miles (control engine) and 3.454 miles (baseline engine). The latter two distances were used to compute the fuel consumption during the first 505 second run after the ten minute soak (third bag). A density of DF-2 emissions diesel fuel of 0.854 gm/cc (7.13 lbs/gallon) was used.

TABLE 8. 1975 FTP TRANSIENT EMISSION RATES - ENGINE 1

Engine Code	Test Configuration	Test No.	Grams per mile			Fuel Econ., mpg	
			HC	CO	NO_2	23 min	505 sec
1-0	Baseline	3	2.51	6.76	14.47	6.29	5.56
		4	2.64	7.11	15.95	6.29	6.05
	Average		2.58	6.44	15.21	6.29	5.81
1-1	Controlled	1	0.39	0.23	8.93	5.94	5.87
		2	0.54	0.22	9.34	6.29	5.34
	Average		0.47	0.23	9.14	6.12	5.61

From the above, it is evident that HC and CO were substantially lower in the control than in the baseline configuration.

F. Summary

Table 9 summarizes the stationary and chassis dynamometer gaseous emission results for Engine 1. The transient cycle results were similar to the stationary operated results with a 96 percent reduction in CO and an 82 percent reduction in HC versus 87 percent and 82 percent, respectively, by the 13 mode test. NO_2 was reduced by 38 percent versus 44 percent from the 13 mode stationary test. From this, it can be concluded that even though the test methods and method of expression were quite different, the trends are the same and the percent reductions were quite similar. Fuel consumption seemed to be decreased slightly by the controlled engine, on the order of two to four percent, depending on the specific procedure followed. In all, the test repeatability and results were quite satisfactory and indicate that the NO_x control system, comprised of the ten percent FGR and three degree retard of static timing, was effective on the constant speed and transient driving schedules. The catalyst appeared to do an excellent job even on the cold start procedure.

TABLE 9. SUMMARY OF ENGINE 1 GASEOUS EMISSION RESULTS

Stationary Results

Engine No.	Description	Grams per Bhp-hr					Cycle BSFC Lb/Bhp-Hr
		HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	HC + NO_2	
		13 Mode FTP					
1-0	Baseline	1.37	4.82	8.01	-	9.38	0.412
1-1	O-Cat, EGR, Timing Retard	0.25	0.64	4.43	-	4.68	0.429
		23 Mode Exp					
1-0	Baseline	1.45	4.92	-	8.10	9.55	0.414
1-1	O-Cat, EGR, Timing Retard	0.40	0.92	-	4.19	4.57	0.427

Chassis Results

1975 LD FTP (LA-4 Mod)

Engine No.	Description	Grams/Mile			Fuel Econ., mpg	
		HC	CO	NO_x	23 min	505 sec
1-0	Baseline	2.58	6.44	15.21	6.29	5.81
1-1	O-Cat, EGR, Timing Retard	0.47	0.23	9.14	6.12	5.61

Federal Smoke Test Results

Engine No.	Description	Smoke Factor, Percent Opacity		
		"a"	"b"	"c"
1-0	Baseline	8.9	10.3	13.6
1-1	O-Cat, EGR, Timing Retard	9.8	11.3	13.9

Summary

Test Procedure	Percent Reductions				
	HC	CO	NO_2	HC+NO_2	Fuel Cons.
13 Mode FTP	82	87	44	50	(4)
23 Mode Exp.	73	81	48	52	(3)
1975 LD FTP	82	96	38	-	(2)*

( ) means increase

*Calculated using gallons per mile.

In summary of the work with Engine 1, substantially reduced HC, CO and NO_2 emissions were demonstrated with the use of an improved pump and low sac injectors, oxidation catalyst, EGR and retarded timing with only slight penalty in fuel consumption and smoke. Driveability of the tractor trailer rig, in which Engine 1 was installed, was found not greatly different from the baseline engine. Tests of the tractor by the 1975 LDV test procedures using the LA-4 driving schedule gave results that were consistent in percent emissions reductions with that found during the stationary 13 and 23 mode tests.

IV. ENGINE 2 RESULTS (361 CID GASOLINE)

Engine 2 was a 1972 model which had been evaluated in a previous control technology project(6). The requirement in this current project was to re-establish the baseline emission level of the engine and to redetermine the "best combination" of emission controls using improved technology where possible. In the previous project a manually operated EGR system was used, but since this current project required operation in a vehicle it was necessary to use an automatically controlled EGR system. The manufacturer of Engine 2 did not have a heavy duty (HD) EGR system, a HD Air Injection system or a catalytic system for this engine. Also, they reported no experimental control systems were available that were applicable to this engine. Therefore,it became necessary to obtain control equipment, primarily a HD EGR system, by other means.

A summary of the computer printouts for the emissions tests conducted are in Appendix B. The many cursory runs made to establish "best combination" and to define some of the unexpected results are not included in the Appendix, but these runs are summarized and discussed where pertinent. Since this was the first engine evaluated, many additional determinations outside the required scope of work were made in order to enable interpretation of some of the results.

A. Equipment Preparation

Available EGR systems were flow checked under engine operating conditions and it was determined that one of the available EGR valves had essentially the desired flow characteristics. This valve was then adapted to the engine and a series of holes for EGR vacuum signal were drilled in the throttle plate section of the carburetor at various distances above the closed throttle plate. This enabled automatically cutting off the EGR vacuum signal at the desired engine vacuum condition by selection of the appropriate EGR vacuum signal port. The conditions obtainable were as follows (Dist. is the distributor vacuum port, and 1, 2, 3 and 4 are the additional ports):

Manifold Vacuum, "Hg	EGR Valve Opening, % of Maximum Open Area				
	Dist.	1	2	3	4
2	20	20	20	20	20
3	85	85	85	85	85
4	100	100	100	100	100
7	80	80	80	80	80
10	70	70	70	100	70
13	70	70	70	0	70
16	70	70	70	0	70
19	70	100	70	0	100
CT	0	0	0	0	0

In the previous project it was determined that best combination was 5 percent EGR at 3 inches Hg manifold vacuum, 10 percent EGR at 10 inches Hg and no EGR below 3 inches Hg or at 16 inches Hg or above. Using the additional vacuum port number 3 for operation of the EGR valve (resulting conditions are nominally 5 percent EGR at 3 inches Hg and 10 percent EGR at 10 inches Hg) the NO_x reductions were as follows in the nine-mode FTP conditions of 3 inches Hg and 10 inches Hg.

	Percent of Standard Baseline Configuration					
Manifold	NO_2		Horsepower		BSFC	
Vacuum, "Hg	Std.	EGR	Std.	EGR	Std.	EGR
3	100	75	100	95	100	102
10	100	50	100	85	100	110

Receipt of new oxidation catalytic units for this engine was delayed since some clauses in the Confidentiality Agreement were in conflict with the contract. Due to the tight schedule requirements, the catalytic units (monolith) from the previous project had to be used on this engine.

B. Stationary Operated Results

1. FTP Nine-Mode

A summary of the nine-mode results with Engine 2 is given in Table 10. Data on three configurations are given including the baseline and two controlled configurations. The two controlled configurations were evaluated on this engine since no criteria were established as to whether a 0.6 Gm/Bhp-hr increase in composite HC was more or less important than a 4 to 6 Gm/Bhp-hr increase in CO.

TABLE 10. FTP NINE-MODE SUMMARY OF RESULTS FOR ENGINE 2

		Average Composite Emissions, Grams/Bhp-Hr					
Engine		HC		CO	NO_2		Cycle BSFC
No.	Configuration	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
2-0	Initial Baseline	3.7	4.7	22.1	16.5	16.1	0.72
2-0	Final Baseline	4.3	5.7	17.4	15.7	15.6	0.73
2-1	EGR+Air+Cat.	2.8	2.7	2.0	8.6	8.6	0.77
2-2	EGR + Cat.	2.2	2.1	5.8	8.7	8.8	0.78
2-2	Repeat of above	2.1	2.0	7.9	8.5	8.0	0.78
Previous Project Results							
	Final Baseline	4.0	-	24.1	12.9	-	-
	EGR*+Air+Cat.	2.1	-	3.6	6.6	-	-

*Manual EGR System

To better enable a comparison of the results, the data in Table 10 was converted to percent as a function of the initial baseline results and these values were as follows:

	Percent of Initial Baseline					
	HC		CO	NO_2		Cycle
Engine	NDIR	FID	NDIR	NDIR	CL	BSFC
Initial Baseline	100	100	100	100	100	100
EGR+Air+Cat.	75	55	10	55	55	107
EGR+Cat.	60	45	25	55	55	108
Final Baseline	115	120	80	95	95	101
Previous Contract EHS 70-110						
Final Baseline	110	-	110	80	-	-
EGR*+Air+Cat.	55	-	15	40	-	-

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*Manual EGR

All subsequent oxidation catalysts evaluated reduced HC emissions to between 5 and 10 percent of the baseline values. As shown, the catalyst used on Engine 2 only reduced the HC emissions to approximately 50 percent of the baseline value, indicating that this catalyst had comparatively low activity. NO_2 was reduced by nearly 50 percent and BSFC increased by 7 to 8 percent in the controlled configurations.

Additional determinations made with this engine and some interpretations of the results are as follows. The additional work with this engine was important in that it laid the groundwork for the remaining gasoline engines studied.

A modal evaluation of the effect of EGR on power, BSFC and NO was made at the 3, 10, and 16 inch Hg modes, and results were as follows:

		Percent of Value Without EGR		
Inches Hg	Condition	NO	Horsepower	BSFC
3	No EGR	100	100	100
3	EGR*	60	91	106
10	No EGR	100	100	100
10	EGR*	50	89	107
16	No EGR	100	100	100
16	EGR**	20	50	200
16	Manual EGR***	50	70	120

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*Automatic EGR valve, vacuum port 3

**Automatic EGR, distributor vacuum port

***Very unstable with EGR at 16 inch Hg setting

Initially, it was concluded that a 50 percent reduction in power at the 16 inch Hg mode using the automatic EGR along with an increase in HC and CO was too great a penalty. Therefore, no EGR was used at the 16 inch Hg mode in the "best combination" configurations. On re-examination, from the standpoint of nine-mode evaluations, the expected large additional reduction in composite NO (estimated to be up to 40 percent) could well be worth the small increase in the composite NO due to the reduction in power output. Driveability might not be significantly affected, since it could require only that the driver depress the accelerator pedal further to obtain the required power.

Another important observation was that the HC level in the CT mode when the air injection and catalyst were installed initially increased greatly and then dropped off slowly with time to a reasonably stable value of about 20 percent of the peak by the end of the CT mode. Under all other configurations (i.e. baseline catalyst without air injection and air injection without catalyst) this extreme drop off of HC at CT was not noted. Normally, the HC level at CT has been reasonably stable after the normal initial instability when the mode switch is made. The significance of this is that since an average value for the CT mode is used, the length of the CT mode can greatly affect the composite HC level with this engine when air injection and a catalyst is used. For example, the lower composite HC value was obtained with EGR plus catalyst in these evaluations, whereas if only the length of the CT mode were increased, by around 50 percent, the lower composite HC value would probably be obtained with air injection in addition to the EGR and catalyst.

BSFC, as weighted for the current nine-mode evaluations, was about seven to eight percent higher for the controlled configuration than for the baseline engine. It should be noted that the inaccuracy of comparing BSFC is large since one is looking at a difference of a few percent among values each of which can vary at least one and possibly two percent. Therefore, the seven percent higher BSFC can normally vary by at least plus or minus one to four numbers.

A question was raised concerning the HC composite values by NDIR in the controlled configurations being slightly greater than the HC values by FID since FID by definition measures total carbon and NDIR measures only certain HC species. Two possible factors enter into this anomaly; the apparent relationship between the CO composite and the HC-FID composite and/or that many of the HC-NDIR readings are below 100 ppm which is below ten percent of full scale and therefore of questionable accuracy.

An interesting analysis of the data is to look at the modal contribution of emissions. This type of information is utilized extensively in the optimization phase with an engine. This modal contribution, presented as follows, is the emission contribution to the composite values and a reduction directly affects the composite.

MODAL CONTRIBUTION OF EMISSIONS TO COMPOSITE VALUE, ENGINE 2

9-Mode FTP

	Emission Contribution, Percent		
	Baseline	EGR-Cat.	EGR-Cat-Air
HC at CT	50	40	60
CO at 3 inch Hg	50	70	Nil
NO at "X" inch Hg	50 at "10"	50 at "16"	50 at "16"

9-Mode EPA

	Baseline	EGR-Cat.	EGR-Cat-Air
HC at CT	50	40	50
CO at 90%T.	70	90	90
NO at "X%" T	40 at "60%"	50 at "30%"	50 at "30%"

These tabulated contributions are approximate and varied significantly from cycle to cycle.

As shown, the CT mode is the large contributor of HC and the 3 inch Hg (or 90 percent T) mode is the large contributor of CO in both the baseline and controlled engine configurations. The 10 inch Hg (60 percent T) mode is the large contributor of NO in the baseline configuration. Due to significant reductions in NO at the 3 inch Hg and 10 inch Hg modes, however, the 16 inch Hg mode becomes the large contributor in the controlled engine configurations. Further reduction of composite NO_2 could be obtained by reduction of the NO in the 16 inch Hg mode.

2. EPA Nine-Mode

A summary of the values obtained in the EPA nine-mode evaluations are shown in Table 11.

TABLE 11. EPA NINE-MODE SUMMARY OF RESULTS FOR ENGINE 2

		Average Composite Emissions Gms/Bhp-Hr					
Engine		HC		CO	NO_2		Cycle BSFC,
No.	Configuration	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
2-0	Baseline	3.6	4.5	35.4	17.2	17.0	.63
2-1	EGR+AIR+CAT.	2.2	1.8	16*	9.5	9.6	.71
2-2	EGR+CAT.	2.2	2.5	40**	10.0	9.8	.71

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* Average of values ranging from 8 to 34

**Average of values ranging from 23 to 51

Composite values for HC are reasonably similar to those for the FTP nine-mode tests. Composite NO_2 values are consistently higher by about ten percent as one would expect since the mode settings for this engine are at higher loads in the EPA nine-mode than in the FTP nine-mode. A significant variation, however, occurred with CO. Baseline CO by the EPA test was over 60 percent higher than CO by the FTP. Controlled configuration CO was so irratic by the EPA procedure that any average of the values is hard to justify. In an evaluation to determine the cause of this variation, it was found that the CO value was extremely load sensitive at the 90 percent torque condition. The results of the evaluation at the 90 percent mode are shown below.

	Percent CO at Percent of Maximum Torque				
	86	88*	90*	92*	94
AIR+CAT.**	0.2	0.5	1	4	7
	1	2	3		6

---

* Torque variation allowed by the procedure

** Roughly corrected for dilution

As shown, there is approximately a 10-fold increase in CO at the 92 percent torque mode over the 88 percent mode when air injection is used. Since the 90 percent mode accounts for such a large portion of the composite CO value in the nine-mode EPA tests with this engine (up to 90 percent of the composite value for the controlled configuration), the composite value is directly affected by the 90 percent torque mode value. Therefore, the torque variation allowed by the procedure could possibly vary the composite CO by as much as 500 percent.

BSFC is lower for the EPA nine-mode than for the FTP nine-mode by 5 to 10 percent. The increase in BSFC for the controlled configuration EPA test is some 10 percent higher than for the baseline EPA test.

3. EPA 23-Mode Procedure

The 23-mode results with Engine 2 are shown in Table 12.

TABLE 12. EPA 23-MODE SUMMARY OF RESULTS FOR ENGINE 2

		Average Composite Emissions			
		Grams per Bhp-Hr			Cycle Weighted
Engine No.	Engine Configuration	HC FID	CO NDIR	NO_2 CL	BSFC lbs/Bhp-Hr
2-0	Baseline	8.1	60.7	12.0	0.69
2-1	EGR + Air + Cat.	4.0	71.1	6.5	0.74
2-2	EGR + Cat.	4.0	96.0	6.6	0.73
Previous Project Results					
	Final Baseline	8.5	65.9	8.3	0.74
	EGR + Air + Cat.*	1.3	19.2	4.1	0.83

---

*No relationship between this test and the test on engine configuration 2-1.

The current baseline results compare well with the baseline results in the previous contract as to composite HC and CO. The composite NO_2 was higher than in the previous project, but the increase was consistent with the equivalent increase found in the FTP nine-mode results. Composite BSFC also differs somewhat between the previous and current projects. The composite results for the controlled engine configuration (Engine 2-1) cannot be compared to the results in the previous work. In the previous work EGR was recirculated at maximum power, thus resulting in a completely different set of power settings than in the current tests, where the automatic EGR cuts out between 80 and 90 percent of maximum power. The previous discussions of the EPA nine-mode results concerning the effect of slight changes in the 90 percent torque mode (92 percent torque mode is used in the 23-mode procedure) also applies to these EPA 23-mode results.

C. Chassis Operated Results

This section describes both road and chassis dynamometer evaluations made with Engine 2.

1. Road

For Engine 2, installed in a 1972 Ford, Vehicle No. 42604, F 700 18 ft. flatbed two axle truck with 5 speed forward transmission and two speed rear axle, all testing was done in high range with all accels from rest in 2nd gear. First gear is actually low-low and is rarely used. The truck was in satisfactory condition with 9537 miles at the beginning and 9938 odometer miles at the end of testing. The test weight was 18,515 lbs while name plate GVW was 25,000 lbs. Empty weight was 11,530 lbs. Tire size was 10.00 - 20. Weather conditions were quite stable throughout the test period with little or no wind or inclement weather. Wet/Dry temperatures and barometric pressures were quite stable. For purposes of discussion, the following observations are offered by the type of operation.

a. Cold Start Driveaway

Each control configuration, control with air injection and control without air, was tested two times. All tests were preceded by a minimum of 16 hours overnight soak before start. Soak temperatures were 75°F inside the Emissions Laboratory and the vehicle was rolled outside before start. Please refer to Appendix M-6 for a description of the test procedure and map of route employed.

The initial start and idle periods were judged similar and satisfactory for both engines with the initial part throttle accel very similar. T to M stumble was noted during this first PT accel to 25 mph. The next portion of the course, the WOT in 4th from 25-35 uphill was similar with the controlled engine (with or without air pump). The next accel was still with 1/2 choke and involved more stumble, average T to H with both engines. The fairly long CT downhill from 25 mph to point H (at about 2300 rpm) caused some light popping in the exhaust, not true backfires, but noticeable when the air pump was used. It seemed that the pops were greater above about 2000 rpm over the course and diminished as the engine warmed up with the repeat round and choke operation off (at point H) during the first round. The engine seemed to flood easily making minimum choke operation necessary.

The WOT accel at points H and J **generally resulted** in M to H stumble in the initial 2nd gear accel and this was true regardless of test configuration. The long quasi-constant speed CT decels may have loaded or pre-conditioned the engine to aggravate the next accel. It was about the same at each stopping point. The three distinct WOT accels (25-40 mph) in 4th from K to L, M to N, and P to Q, were all done without difficulty and were mostly satisfactory with occasionally a T stumble or T to M hesitation.

The repeated stumble of M to H in the initial 2nd gear accel may also have been aggravated by driving in the high instead of low rear axle range. One run was made in high range and stumble in 2nd and 3rd was noticeably less. This range, however, would not give vehicle speeds and engine speeds that were of interest and that would be compatible with the warm driving and performance test. Therefore, it was decided to conduct all testing in high range. Starting in first, a low-low, is not normal driving habit for paved roads and the type course used. Using both ranges was considered too complicated and confusing for the tests required and judgements involved.

Overall, the control equipped vehicle completed the cold start driveaway procedure as well as the uncontrolled engine though both driver and observer noted a slightly more sluggish operation under certain accels. The relatively severe M to H stumbles may have masked some small driveability penalty during accels and T to M hesitation was noticed a few times with the controlled engine. The only obvious item was the light popping in the exhaust during the CT decels, especially above 2000 rpm that was noticed early in the test and diminished as the engine warmed up. This very light backfiring, i. e., 3-8 light pops, disappeared completely after the first round of the course. Without the air pump, no exhaust noises were noted other than usual for the vehicle.

At no time under any test configuration was any surge, detonation or rough idle quality found. The truck rarely had noticeable hesitation and lean or stretchy type operation was not encountered so that it could be rated. In short, the cold start driveaway test gave essentially equivalent results, regardless of test configuration. The control equipped engine was no better and not enough worse to so identify by this procedure within its limits of repeatability and accuracy. On installation of the original engine back into the test truck, a cold start-driveaway test was made to determine if the truck stumbled with the as-received engine. It was found that it did, especially after the manual choke was discontinued. It is uncertain if all similar trucks powered by Engine 2 have similar driveability difficulties, but at least these two did.

b. Warm Driveability

This procedure requires about three hours to perform and features determination of road load vacuum and engine speed at true vehicle speeds of 20, 30, 40, 50 and 60 mph. Aside from the 50 mph road load indication, used to preset the chassis dynamometer for 1975 FTP type light duty tests, the major finding was the effect of the EGR to require a greater throttle movement, lower vacuum, to achieve the 60, 50 and 40 mph cruise. The 60 mph road load vacuum was 4.0 versus 6.7 in Hg uncontrolled, the 50 mph road load vacuum was 8.9 versus 10.1 in Hg uncontrolled, and the 40 mph road load vacuum was 12.5 versus 13 in Hg uncontrolled. Recall that the EGR valve was modulated automatically to transition from essentially closed to fully open between 12 and 15 in Hg. The controlled engine road load vacuum was about the same with and without the air pump belt on and pump operative. The power pulled by the pump was not noticed during the cruise road load experiments.

Various types of PT accels were made at very light (14 in Hg), moderate(10 in Hg), and heavy (6 in Hg) PT in 4th gear from 25 to 40 mph on level road. The major change in driveability was a stretchy-lean type of operation with the controlled engine. This was, in fact, the only serious area of driveability and occurred whether the air pump was operative or not. Also a T to M hesitation was found that occurred early in the acceleration. This mild hesitation then gave way to a stretchy type operation as if the engine was overly lean. A good example would be that noticed with light duty automobiles with EGR where the engine acted as if it were fuel deficient. The engine wants to run smoother and pull better but can't. To make certain that the EGR was the cause, a series of back-to-back PT accels were made with and without the valve operative. By preventing EGR, the usual smoothness of the engine was restored.

Light, moderate and heavy crowds (accels) also produced stretchy operation at the start of the crowd and was most noticeable at the light crowd accel. The first part of a light crowd approximates a light PT accel and T to M stretchy and T to M hesitation was found with the controlled engine. The air pump had no effect.

A variety of closed throttle and part throttle decelerations from 40 mph in 4th resulted in comparable, satisfactory, vehicle operation. The light popping with the cold start procedure described earlier was not present during the warm driveability runs. After repetitive 0-60 mph WOT accels, the engine idled satisfactorily, and showed no after-run tendency. The engine easily restarted after the 15 minute hot soak. At no time did the engine detonate, surge or fail to idle satisfactorily.

In all, the two major findings of the warm driveability was the requirement for greater throttle depression, lower intake manifold vacuums, at the 60, 50, and 40 mph level road load cruise due to the EGR NO_x emissions control system. The other item was the T to M stretchy and hesitant, lean type operation under PT accel conditions. This operation, not evident at the cruise conditions where the inertia of the truck may have tended to mask over the stretchiness, was probably the most serious driveability effect and was directly attributed to the EGR system. All operation at WOT seemed little affected by the control system since EGR is programmed to be zero flow at that condition to maintain maximum engine power.

c. Vehicle Performance

The final portion of each driveability series was a series of accelerations from 0-20, 0-40, 0-60, 20-50 mph on level road at WOT. Essentially equivalent road performance was obtained with or without the controlled engine. The times and distances required to reach 20, 40, and 60 mph from rest and the 20 to 50 mph accel were quite comparable. Average performance is listed below.

			Accelerations, mph			
Engine	Configuration		0-20	0-40	0-60	20-50
2-0	Baseline	Time, sec	11.1	34.3	79.5	41.3
		Dist, miles	0.040	0.263	0.971	0.466
2-1	Controlled, w/air pump	Time, sec	11.5	34.9	85.5	43.9
		Dist, miles	0.041	0.268	1.070	0.502
2-2	Controlled, w/o air pump	Time, sec	11.2	35.2	80.5	44.8
		Dist, miles	0.039	0.270	0.987	0.477

Note that when the air pump was connected and operative, Engine 2-1, slight differences were found in the time and distance required to reach specified speeds. These increases, relative to the controlled engine without air pump (Engine 2-2) were very slight with part of the difference within experimental accuracy.

The best indication of the vehicle's ability to operate was the grade performance. This is a 1.075 mile course that is level for about the first 0.75 miles and finishes steep uphill at a constant grade for about 0.25 miles. The vehicle is accelerated from rest to its maximum speed with intent to get to the top of the hill as quickly as possible. The following are average times, distances and speeds attained.

Engine	Configuration	Distance miles	Max Speed, mph	Time Required seconds
2-0	Baseline	1.083	44.0	91.0
2-1	Controlled w/ pump	1.067	42.5	92.0
2-2	Controlled w/o pump	1.070	44.3	89.4

Note that the time was higher and max speed lower when the air pump was operative, Engine 2-1, than the baseline or controlled engine w/o pump on.

Since this was a maximum, all-out performance test and since the exhaust catalysts have only a slight effect on power (EGR is off at WOT), the Engine 2-0 and 2-2 performance is quite similar. Both achieve 44 mph at the crest of the hill. The air pump draws some power that evidently showed in the uphill runs more so than in the 0-60 and 0-40 mph WOT accelerations. The values listed were the average of at least two runs, north and south, on the accels and duplicated on the uphill runs. Satisfactory repeatability was attained.

The major conclusion of these performance tests was that the vehicle tended to have essentially equivalent acceleration times. The truck continued to have on the average a moderate stumble in 2nd gear accel from rest with occasional T to M stumble in 3rd with a T hesitation sometimes in 4th. These quality observations were quite similar to the cold and warm driveability evaluations. When the air pump, Engine 2-1, was operative, there was a very slight decrease in the acceleration and grade performance. The time required was increased slightly while the maximum speed attained decreased slightly on the grade test.

d. Catalyst Temperatures

The fourth portion of the road test procedure involved operating the catalytic muffler equipped truck for 5 minutes at 60, 50, and 40 mph in 5th while recording the catalyst outlet temperatures from each reactor in 10 second intervals. These temperatures are summarized on Table 13 and the max, min, and arithmetic average value indicated at the bottom. One set of runs were made with the air pump connected and operative and one set made with the pump belt off and the pump inoperative.

Occasionally the before temperatures were checked and found to be only slightly different from the outlet temperature. Normally, the difference was 20 to 60 degrees F and averaged on spot checks about 30°F. The average road outlet temperatures, shown in Table 13, were quite similar to that found in the stationary dynamometer operation. At no time during any of the road operation, with or without air pump, did the catalyst outlet temperatures exceed 1600 degrees F. Both catalysts temperatures were monitored during the cold and warm driveability as well as during the acceleration performance trials.

2. Chassis Dynamometer

Both nine-mode type tests and transient LA-4 1975 FTP type tests were made with Engine 2 installed in the truck.

a. Nine-Mode FTP

Immediately after the engine was installed in the truck, repli-

TABLE 13. CHASSIS OPERATED ENGINE 2
CATALYST OUTLET TEMPERATURES 5TH GEAR-HIGH RANGE

	60 mph Cruise				50 mph Cruise				40 mph Cruise			
	Left		Right		Left		Right		Left		Right	
Min:Sec	2-1	2-2	2-1	2-2	2-1	2-2	2-1	2-2	2-1	2-2	2-1	2-2
0:0	1460	1420	1430	1420	1400	1350	1320	1340	1200	1300	1200	1340
0:10	1460	1460	1420	1450	1400	1390	1360	1390	1250	1320	1220	1330
0:20	1440	1540	1410	1500	1420	1400	1340	1360	1200	1300	1200	1300
0:30	1420	1510	1400	1480	1420	1390	1360	1360	1160	1280	1160	1280
0:40	1400	1470	1400	1420	1460	1420	1400	1400	1170	1240	1160	1250
0:50	1400	1440	1410	1440	1500	1430	1410	1390	1160	1230	1140	1240
1:00	1440	1450	1450	1440	1500	1410	1420	1390	1140	1220	1120	1220
1:10	1480	1490	1480	1480	1500	1430	1410	1400	1140	1210	1120	1220
1:20	1430	1520	1490	1500	1430	1420	1310	1400	1120	1200	1120	1200
1:30	1510	1550	1500	1520	1380	1400	1330	1380	1120	1200	1120	1200
1:40	1520	1400	1500	1460	1380	1390	1330	1380	1100	1180	1100	1170
1:50	1520	1450	1500	1420	1390	1400	1330	1390	1110	1160	1100	1160
2:00	1520	1430	1500	1410	1350	1430	1300	1420	1100	1160	1100	1150
2:10	1520	1430	1500	1420	1300	1390	1280	1400	1100	1150	1180	1150
2:20	1520	1460	1480	1440	1310	1400	1280	1400	1110	1140	1110	1140
2:30	1500	1560	1470	1490	1300	1400	1260	1390	1130	1140	1130	1140
2:40	1480	1530	1460	1520	1300	1390	1270	1380	1140	1140	1140	1140
2:50	1570	1540	1480	1520	1310	1360	1290	1350	1140	1150	1140	1140
3:00	1530	1510	1520	1490	1340	1370	1360	1360	1140	1150	1120	1150
3:10	1530	1500	1520	1490	1380	1380	1340	1360	1120	1160	1120	1170
3:20	1570	1490	1470	1400	1370	1380	1340	1360	1120	1180	1170	1190
3:30	1500	1440	1480	1410	1420	1400	1420	1380	1130	1180	1120	1180
3:40	1540	1450	1520	1420	1440	1420	1420	1410	1130	1170	1130	1170
3:50	1560	1450	1520	1420	1420	1410	1380	1400	1140	1160	1140	1160
4:00	1520	1460	1490	1410	1380	1460	1360	1390	1170	1180	1170	1200
4:10	1510	1440	1500	1400	1360	1390	1360	1390	1180	1200	1180	1220
4:20	1540	1440	1500	1420	1400	1420	1370	1420	1180	1200	1170	1200
4:30	1510	1460	1500	1420	1360	1400	1340	1390	1160	1200	1150	1200
4:40	1500	1440	1490	1400	1300	1380	1290	1360	1160	1200	1150	1200
4:50	1520	1420	1510	1400	1320	1370	1320	1360	1140	1200	1140	1200
5:00	1540	1410	1490	1390	1380	1360	1370	1350	1150	1180	1150	1180
Max	1570	1560	1520	1520	1500	1460	1420	1420	1250	1320	1220	1340
Min	1400	1400	1400	1390	1300	1350	1260	1340	1100	1140	1100	1140
Avg.	1499	1470	1477	1445	1385	1398	1344	1382	1145	1196	1144	1200

2-1 Control	Equipped with air pump
2-2 Control	Equipped without air pump

cate nine-mode tests were made using a chassis alternative to the 1970-1973 FTP. These results along with the last series of baseline runs on the stationary dynamometer are listed in Table 14.

TABLE 14. ENGINE 2-0 STATIONARY AND CHASSIS NINE-MODE FTP.

			NDIR Instrument Results		
Dynamometer	Test	Run	HC, ppm Hex	CO, %	NO, ppm Corr.
Stationary	12	1	138	0.385	2108
Stationary	12	2	140	0.349	2000
Average			139	0.367	2054
Chassis	1	1	152	0.355	2443
	1	2	149	0.431	2477
	1	3	146	0.412	2344
Average			149	0.399	2421

This rather good agreement indicates that no significant changes in engine operation resulted from the installation of the engine into the truck. In all cases the chassis results were higher than the stationary, ranging from 7 for HC to 18 percent for NO. Past experience on the relationship between the chassis and stationary operated nine-mode FTP indicates this level of agreement to be well within the range usually encountered.

b. 1975 Light Duty FTP

Replicate 1975 FTP light duty tests were made with Engine 2 in all three configurations. The inertia weight was 16,000 lbs and the level road load at 50 mph was 34 hp at the rear wheels. This road load seems low relative to most trucks but was confirmed a number of times using the same vacuum gage when operating on the road. On one or two trucks in the past, an unusually low road load has been found with no explanation. All tests were made in high rear axle range, starting in second and upshifting to third at 15 mph, as specified, to fourth at 30 and fifth at 45 mph. This shift pattern was better than the 25 and 40 mph points marked on the LA-4 driving aid strip chart. Table 15 is a summary of the results by engine configuration.

The emission rates are all based on 7.5 miles of driving, the length specified in the Federal Register. The fuel consumption values are all based on actual net fuel used and measured (5th wheel) miles traveled for the two distinct driving segments, the first 23 minutes or complete LA-4 and then the first 505 seconds of the LA-4 which is done after the prescribed 10 minute soak. The measured distance for the 23-minute test

TABLE 15. 1975 FTP TRANSIENT EMISSION RATES - ENGINE 2

Engine Code	Configuration	Test No.	Grams per Mile			Fuel Econ., mpg	
			HC	CO	NO_x	23 min	505 sec
2-0	Baseline Uncontrolled	5	13.73	211.9	11.58	4.46	5.06
		6	13.13	204.5	12.96	4.57	5.14
	Average		13.43	208.2	12.27	4.52	5.10
2-1	Oxid Cat, EGR, Air	1	6.65	157.0	8.17	4.76	5.16
		2	7.88	180.3	7.77	4.31	4.80
	Average		7.27	168.7	7.97	4.54	4.98
2-2	Oxid Cat, EGR, No Air	3	13.38	245.0	6.74	4.38	4.85
		4	10.33	201.0	8.81	4.31	5.05
	Average		11.86	223.0	7.76	4.35	4.95

is usually less than 7.5 miles with an average distance of 7.353 miles. One reason for the slightly lower mileage is inability of the truck to accelerate as rapidly to 56 mph as indicated by the LA-4 test. There are cars which cannot do so either and provision is made for this in the FTP. Incidentally, it is not known how much the average or slightly below average powered car travels during the LA-4 test. In short, the 7.353 average length may be quite reasonable relative to some fairly heavy automobiles with small engines. The average distance for the first 505 seconds was 3.493 miles.

In all, the test repeatability and results were quite satisfactory and indicate that the NO_x control system was effective on transient driving schedule. HC and CO seemed to be reduced by the catalyst and more so when the air pump was in operation (configuration 2-1) than when the air was cut off (Engine 2-2). In this sense, the nine-mode FTP failed to yield results consistent with the LA-4 and this is probably due to the gross differences in method of operation and the weighting factors among others discussed previously. Copies of the computer reduced data for the six 1975 FTP tests made with this engine are included as Tables B-33 to B-38 of Appendix B. Please refer to these print-outs for more details on this test series.

D. Summary

In summary of this task, a series of stationary dynamometer tests with engine 2 were conducted to determine the extent of reduction in tailpipe emissions of HC, CO, and NO_x. Three test procedures, the FTP and EPA nine-mode and an experimental 23-mode procedure were employed. The results, listed in Table 16, were promising in that subs-

TABLE 16. SUMMARY OF ENGINE 2 RESULTS

Stationary Results

Engine No.	Engine Description	HC NDIR	HC FID	CO NDIR	NO$_2$ NDIR	NO$_2$ CL	Cycle BSFC Lb/Bhp-hr
			Nine-Mode FTP				
2-0	1972 Std	4.0	5.2	19.8	16.1	15.9	0.73
2-1	EGR, Air, O-Cat	2.8	2.7	2.0	8.6	8.6	0.77
			Nine-Mode EPA				
2-0	1972 Std	3.6	4.5	35.4	17.2	17.0	0.63
2-1	EGR, Air, O-Cat	2.2	1.8	16	9.5	9.6	0.71
			23-Mode Exp				
2-0	1972 Std	-	8.1	60.7	-	12.0	0.69
2-1	EGR, Air, O-Cat	-	4.0	71.1	-	6.5	0.74

Chassis Results
Nine-Mode Chassis

Engine No.	Description		HC ppm Hex	CO %	NO (Corr) ppm
2-0	1972 Std	Stationary	139	0.37	2054
		Chassis	149	0.40	2421

1975 LD FTP (LA-4 MOD)

Engine No.	Description	Grams/Mile HC	Grams/Mile CO	Grams/Mile NO$_x$	Fuel Econ. mpg 23 min	Fuel Econ. mpg 505 sec
2-0	1972 Std	13.4	208.2	12.3	4.5	5.1
2-1	EGR, Air, O-Cat	7.3	168.7	8.0	4.5	5.0

Summary

Test Procedure	Percent Reductions HC (FID)	Percent Reductions CO	Percent Reductions NO$_2$ (CL)	Percent Reductions Fuel Cons
9-Mode FTP	48	90	46	(5)
9-Mode EPA	60	55	44	(13)
23 Mode Exp	51	(17)	46	(7)
1975 LD FTP	46	19	35	(1)*

( ) means increase
*Calculated using gallons per mile.

tantial emission reductions in all categories were demonstrated with some increase in fuel consumption.

The percent reductions by Engine 2-1 relative to Engine 2-0 are listed at the bottom of Table 16. They were computed using an average baseline 2-0 value obtained during the stationary testing. HC by FID was consistently reduced by the controlled engine on the order of 46 to 60 percent while NO_2 was reduced on the order of 35 to 46 percent, depending on the test procedure. Fuel consumption was always increased up to as high as 13 percent, again depending on the specific test procedure employed. The CO results did not show a consistent reduction and ranged from 90 percent by the nine-mode FTP to 17 percent increase by the experimental 23-mode method.

A series of chassis tests to determine cold start driveaway, warm driveability and acceleration performance were made with the engine in baseline and control equipped. The major finding was a hesitation under part power cruise and acceleration indicative of lean and stretchy operation not unlike that of certain passenger cars equipped with EGR.

V. ENGINE 3 RESULTS (350 CID GASOLINE)

The stationary dynamometer phase with Engine 3 was begun immediately following the removal of Engine 2 from the test cell and preliminary FTP and EPA nine-mode baseline results were obtained. However, due to mechanical failure of the dynamometer, the stationary study of Engine 3 was delayed. After the dynamometer was repaired and failure occurred again, Engine 3 was moved to another dynamometer in an adjacent test cell.

Changes made to convert the engine from the 1972 to 1973 configuration included the carburetor, distributor, and air cleaner assembly. The principal emission controls were oxidation catalysts (monolith), air injection, EGR, and an emission control system which uses thermal oxidation and a reduction catalyst.

A. Stationary Operated Results

The discussion in this report of the many runs associated with Engine 3 is separated, where feasible, into the various test procedures which included FTP and EPA nine-mode, and EPA 23-mode. For sake of continuity and clarity of test results, the emission control system is discussed last in this report and includes results of all FTP and EPA nine-mode, and EPA 23-mode runs conducted with the system. The summaries and computer printouts for the emission tests with Engine 3 are in Appendix C.

1. FTP 9-Mode Results

Shown in Table 17 is the FTP nine-mode emissions summary for the 1972 (3-00) and 1973 (3-0) standard baseline engines.

TABLE 17. NINE-MODE FTP EMISSIONS SUMMARY FOR 1972 (3-00) AND 1973 (3-0) STANDARD BASELINE ENGINES

				Average Composite Emissions, Grams/Bhp-Hr					
			Engine Config-	HC		CO	NO_2		Cycle BSFC
Test	Run	Date	uration	NDIR	FID	NDIR	NDIR	CL	Lbs/Bhp-Hr
13	1, 2, 3, 4	5-3	3-00	3.8	4.7	16.6	11.0	11.0	0.62
15	1, 2, 3	5-7	3-0	3.8	4.6	29.2	8.3	8.0	0.70
70	1, 2, 3	8-16	3-0	3.6	4.5	32.3	6.6	6.6	0.73
87	1	9-6	3-0	4.0	5.6	39.4	6.7	6.2	0.72
97	1, 2, 3	9-17	3-0	4.4	6.3	45.7	6.9	6.3	0.78
	Average		3-0	4.0	5.3	36.7	7.1	6.8	0.73

Tests 13 and 15 in Table 17 were the initial nine-mode FTP baseline tests conducted with Engine 3. In consultation with the Project Officer, Engine 3-0 was selected as the baseline configuration for use in the optimization of emission controls.

It may be observed in Table 17 that subsequent "recheck" runs with Engine 3-0 (Test Nos. 70, 87, and 97) produced significant variation in composite emission and BSFC values. Generally, CO, HC, and BSFC increased and NO_2 remained essentially constant in these three tests. These emission and BSFC variations were of some concern, and therefore, a concerted effort was made to locate some cause of the variation. The electrical system, carburetor, and compression ratio of the engine were checked and found to be within the specified limits. Emission analyzers and span gases were also checked and found to be in order.

Although some of the emission variation discussed above was observable in most of the power modes, the variations were more prominent at the 3-inch mode. These pronounced emission changes in the 3-inch mode were indicative of a variation of carburetor power valve setting which might have caused enrichment of the air-fuel mixture at the 3-inch mode. This in turn could account for the significant increase of CO and the noticeable increase of HC in the 3-inch mode.

For comparison of Engine 3-0 results with subsequent controlled configuration results, an average of Test 15, 70, 87, and 97 data in Table 17 will be used. These averaged baseline results and the FTP nine-mode results obtained with the controlled configurations are shown in Table 18.

TABLE 18. NINE-MODE FTP EMISSIONS SUMMARY FOR CONTROLLED CONFIGURATION AND 1973 STANDARD ENGINE

Engine		Average Composite Emissions Grams/Bhp-Hr					Cycle BSFC
		HC		CO	NO_2		
No.	Control Parameter	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
3-00	1972 Standard	3.8	4.7	16.6	11.0	11.0	0.62
3-0	1973 Standard	4.0	5.3	36.7	7.1	6.8	0.73
3-1	O-Cat, Air, EGR	1.9	0.4	4.1	4.3	3.6	1.03
3-1X	O-Cat, Air, EGR (modified)	1.3	0.3	4.3	4.5	4.2	0.89

The controlled configurations in Table 18 included two oxidation catalysts, two air pumps with suitable air injection into exhaust manifolds, and EGR. The EGR valve provided for this engine was found to be rather severe in EGR rate at the 10 and primarily the 16-in. Hg. modes. A washer was mounted on the end of the pintle such that at the 10 and 16-inch modes the washer restricted the exhaust gas flow, thereby decreasing the EGR rate relative to the standard pintle. With the modified EGR valve, used with Engine 3-1X, the power output at the 16-inch mode was significantly increased. The 16-inch modal brake horsepower was 8 with the standard EGR and 15 with the modified EGR, or almost a 100 percent increase. Compared to the standard EGR, the modified EGR produced a slight reduction of HC emissions at the 16-in. mode and some increase of NO_2 emissions at the 10 and 16-inch Hg modes. The increase in NO_2, however, was offset by the increase in power output. The overall net result was that the composite emissions remained essentially unchanged. The composite BSFC was decreased significantly when using the washer on the EGR valve.

A comparison of results with Engines 3-1X and 3-0 shows all emissions were significantly reduced with the controlled configuration. The reduction of hydrocarbons is better demonstrated with the FID data since the NDIR analyzer's sensitivity is known to be limited at these rather low hydrocarbon levels. Accordingly, composite HC-FID was reduced by 94 percent. Composite CO and NO_2-NDIR were reduced by 89 and 38 percent, respectively and BSFC was increased 22 percent.

2. EPA Nine-Mode Results

The optimized configuration of Engine 3 by the EPA nine-mode procedure came out to be essentially the same as that determined by the FTP nine-mode. With the EPA nine-mode procedure, the BSFC was not affected by the washer on the EGR valve as was the case with the FTP nine-mode. Table 19 is a summary of the results with the 1972 (3-00) and 1973 (3-0) standard engines and the controlled configuration (3-1 and 3-1X).

Engine 3-00 and 3-0 HC results were very similar as shown by the table. The CO level with Engine 3-0 was more than double that of Engine 3-00, whereas the NO_2 was nearly reduced by half. Cycle weighted BSFC was about 8 percent higher with the 1973 baseline version.

The results of the controlled configuration with standard and modified EGR were virtually identical, with only minute differences in HC-FID and CO-NDIR emissions. The BSFC with both engine configurations was identical at a value of 0.80 lb/bhp-hr.

TABLE 19. NINE-MODE EPA EMISSIONS SUMMARY FOR ENGINE 3 BASELINE AND CONTROLLED CONFIGURATIONS

Engine		Average Composite Emissions Grams/Bhp-Hr					
		HC		CO	NO_2		
No.	Control Parameter	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lb/Bhp-Hr
3-00	1972 Standard	3.5	4.5	16.4	11.3	11.1	0.62
3-0	1973 Standard	3.3	4.8	36.0	6.1	5.7	0.67
3-1	O-Cat, Air, EGR	0.7	0.2	3.6	3.9	3.5	0.80
3-1X	O-Cat, Air, EGR (modified)	1.2	0.2	2.8	4.0	3.5	0.80

Hydrocarbons by FID in the 1973 baseline engine (3-0) were reduced by 96 percent with the controlled configurations. Carbon monoxide was reduced in the same engines by an average of 91 percent and NO_2-NDIR was reduced 33 percent. With the controlled configuration, the composite BSFC increased by almost 20 percent.

The EPA nine-mode results in Table 19 were found to be in good agreement, generally, with FTP nine-mode results of corresponding engine configurations shown in Table 18. The primary difference noted is in the composite BSFC, with Engine 3-1 having a 29 percent higher value in the FTP nine-mode than in the EPA nine-mode procedure.

3. EPA 23-Mode Results

Table 20 summarizes the 23-mode results of the 1972 and 1973 baseline engines. Engine 3-1X which used oxidation catalysts, air injection,

TABLE 20. 23-MODE EMISSIONS SUMMARY FOR ENGINE 3 BASELINE AND CONTROLLED CONFIGURATIONS

Engine		Average Composite Emissions, Grams/Bhp-Hr					
		HC		CO	NO_2		
No.	Control Parameter	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp-Hr
3-00	1972 Standard	----	7.9	91.9	----	5.3	0.67
3-0	1973 Standard	----	10.2	94.1	----	4.5	0.71
3-1X	O-Cat, Air, EGR (modified)	----	0.6	13.7	----	2.9	0.73

and the modified EGR valve, are also listed in Table 20.

As shown in Table 20, the 1973 standard engine relative to the 1972 had 29 percent higher HC, 6 percent higher BSFC and 18 percent lower NO_2. With respect to the 1973 baseline, the controlled configuration engine significantly reduced all emissions. With the controlled engine (3-1X), the 1973 baseline HC was decreased by 94 percent, the CO decreased by 85 percent, while NO_2 was reduced by 36 percent. Composite BSFC, with the controlled configuration, was increased only 3 percent relative to the 1973 baseline engine.

4. Emission Control System

An experimental emission control system, utilizing thermal reaction and reduction catalysts, was evaluated on Engine 3.

The FTP nine-mode, EPA nine-mode, and EPA 23-mode emissions summary compiled for the emission control system used with Engine 3 is presented in Table 21. Corresponding baseline engine data obtained with each test procedure are included for comparison of the emissions and cycle weighted BSFC.

Since it was not practical in this project to mount and operate this system in a truck, a more experimental approach was subsequently taken. This system consisted of manifold air injection, manifold thermal reaction, and reduction catalysts directly followed by thermal reaction. In addition to the manifold air injection, additional air is supplied just prior to the final thermal reaction chamber.

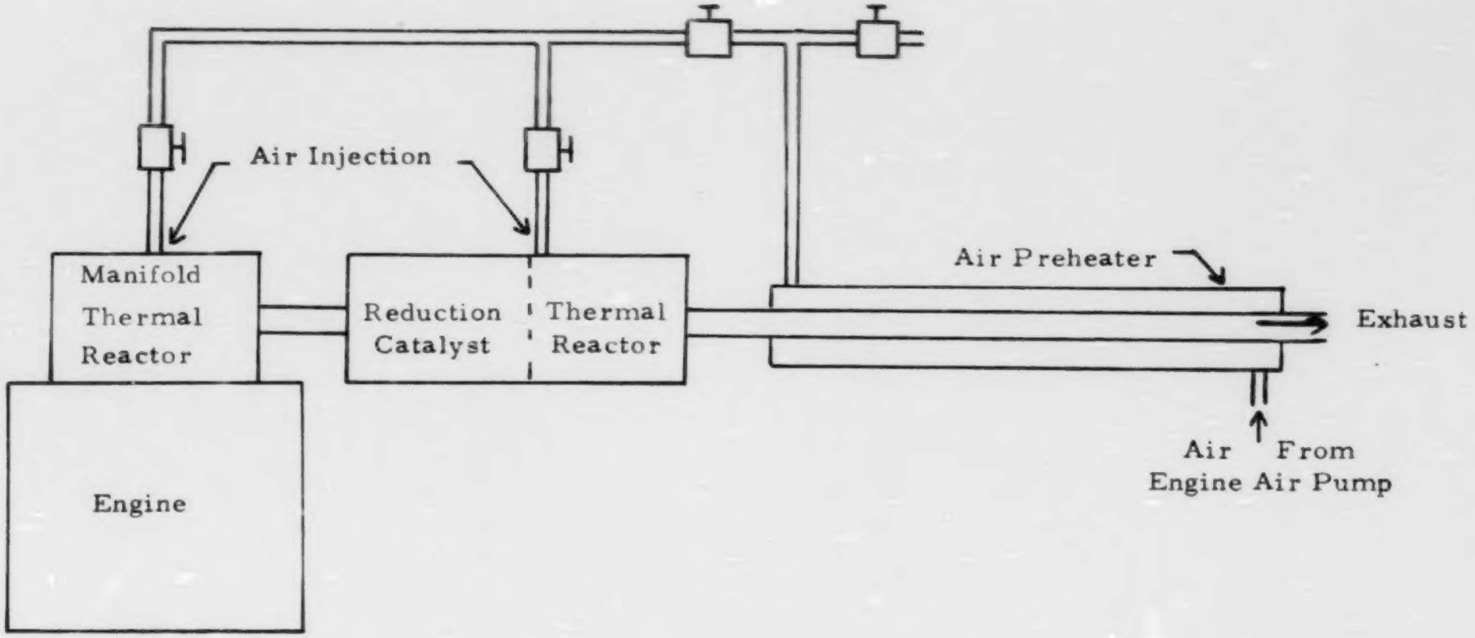
Mounting of the system onto the engine within the dynamometer test cell was difficult due to interference in several areas. Installation was eventually accomplished with no functionally serious modifications.

Since this engine was a V-8 with two exhaust manifolds, dual emission control systems were required. Two air pumps were also utilized and all air manifolding was in separated systems. Air control was accomplished using hand operated valves which controlled the air flow to the manifold injectors, the final thermal reaction chamber and to an atmospheric dump. The system is illustrated in the following schematic. An expected difficulty with this system was that since the engine driven air pump is essentially a constant volume pump (at constant engine speed), adjustment of either of the air injection valves also effects the flow through the other valve. Careful control of the air rates at each mode of the test procedure was determined to be essential for effective procedural optimization. For operation of this system in a vehicle, a rather sophisticated automatic air control system would be required.

TABLE 21. NINE-MODE FTP, NINE-MODE EPA, AND 23-MODE EPA EMISSIONS SUMMARY FOR ENGINE 3-2 WITH EMISSION CONTROL SYSTEM

Test	Run	Test Procedure	Control Parameter	Average Composite Emission Grams/Bhp-Hr					Cycle BSFC, Lb/Bhp-Hr
				HC		CO	NO_2		
				NDIR	FID	NDIR	NDIR	CL	
80, 83	1, 2, 1	FTP 9-mode	Emission Cont. System	0.8	0.3	12.8	1.0	0.3	0.92
80	3	FTP 9-mode	4 Degrees Ret., ECS	1.2	0.9	20.0	1.1	0.5	1.07
81	2	FTP 9-mode	Leaner Carb Jets, ECS	0.9	0.2	16.9	0.9	0.3	0.90
82	1	FTP 9-mode	Richer Carb Jets, ECS	0.8	0.2	22.0	0.8	0.4	1.02
86	1	FTP 9-mode	Optimized, ECS*	0.7	0.1	1.8	0.4	0.2	0.94
1973 Baseline		FTP 9-mode	--	4.0	5.3	36.7	7.1	6.8	0.73
84	1, 2, 3	EPA 9-mode	Emission Cont. System	0.8	0.1	12.9	0.8	0.3	0.87
1973 Baseline		EPA 9-mode	--	3.3	4.8	36.0	6.1	5.7	0.67
85	2	EPA 23-mode	Optimized ECS*	---	0.1	3.3	---	0.3	1.00
1973 Baseline		EPA 23-mode	--	---	10.2	94.1	---	4.5	0.71

*Optimized for each mode in the respective test procedure


Air Injection
Manifold
Thermal
Reactor
Engine
Reduction
Catalyst
Thermal
Reactor
Air Preheater
Exhaust
Air From
Engine Air Pump

SCHEMATIC OF EMISSION CONTROL SYSTEM - ENGINE 3

Since engine produced carbon monoxide must be high for effective operation of this system, rather extensive carburetor modifications were required. The high CO level (obtained by fuel rich intake mixture) serves to produce a low NO_x output from the engine and provides a heat source in the exhaust to enable bringing the reduction catalysts up to an efficient operating temperature. The carburetor modifications for this evaluation included removal of the metering rods and selection of the proper main jets, blocking the power circuit, enlarging the idle adjustment orifices and the idle fuel flow orifice. With these modifications, the CO production at the various power producing modes of the nine-mode FTP could be established at any level below ten percent with a maximum variation mode-to-mode of only a little more than one percent. The level of CO at idle could be adjusted to the desired concentration independent of the power producing modes.

In the early stages of the evaluation, several things became apparent. First, the amount of air supplied through the air system was marginal for complete oxidation of CO. Second, a single setting of the air flow control valves could not begin to effectively cover the air flow requirements over the various modes of the test procedures. Third, the adjustment of the system is somewhat complex.

Therefore, it was decided to conduct the evaluation two ways: First, to optimize the system as well as it could be with a single setting of the air control valves and run several tests. Second, to then connect both air pumps to one leg of the exhaust and carefully optimize each mode. From these modally optimized results, simulated tests would then be constructed which illustrate the results that could be expected if an appropriate automatic air control system were developed.

Several nine-mode FTP tests were run (Tests 80, 81, 82, and 83), including single runs at 4° retarded spark and with leaner and richer carburetor jets. Due to the marginal conditions, the temperature of the engine and the test cell at the start of the test-run generally had more effect on the composite emissions than did the various changes that were made. The 4° retarded spark setting (Test 80, Run 3) and the richer carburetor jets (Test 82) did have a significant detrimental effect on composite BSFC. The results obtained in these runs (consistently greater than 90 percent reduction in HC by FID and NO_2 by CL, and somewhat greater than 50 percent reduction in CO) indicated that optimization was being approached with all emissions except CO. Similar results were also obtained in the nine-mode EPA test (No. 84).

A 23-mode EPA test was started, but due to the depletion of oxygen at the higher load modes and the resultant increase in CO, the test was aborted. A 23-mode test (No. 85) was then run in which each mode was inidividually optimized. Following this, the individual modes of the nine-mode FTP were individually optimized and these data were used to fabricate a simulated test (No. 86). Engine produced CO for these modally optimized runs was nominally six percent and greater and 1550°F reduction catalyst temperatures were maintained at all modes except for the idle modes which occasionally dropped a little below 1550°F. The majority of the modes were run at a reduction catalyst temperature of 1800°F. The results of the modally optimized tests were as follows:

Test	Procedure	Emissions, Grams/Bhp-Hr HC-FID	CO	NO_x-CL
85	23-mode EPA	0.1	3	0.3
86	9-mode FTP	0.1	2	0.2

All of the emissions represent greater than a 95 percent reduction with respect to the baseline configuration. Increase in composite BSFC over the baseline configuration ranged from a little over 20 in the nine-mode FTP to about 30 percent in the nine-mode EPA and about 40 percent in the 23-mode EPA.

In summary, based on this evaluation with one engine, this emission control system has the capability of reducing the exhaust emissions to very low values. Whether this system represents a practical approach to exhaust emission control in actual vehicle operation is in part dependent on the extent of the air system control that is required. Presently the air system control requirements for heavy duty applications have not been well defined. Another factor which has not been well defined is the effect of the required fuel-rich mixture on engine maintenance and durability.

B. Chassis Operated Results

Engine 3 was installed in a 1970 Chevrolet C-50 two-axle delivery truck E-Z Haul number BO 37011, license 290729. The 18 ft. van was equipped with a 4 speed forward transmission and single speed rear axle with 8.25-20 tires. The gross vehicle weight was taken as 24,000-lb, similar to the other two delivery van and stake, trucks 2 and 4, although E-Z haul licenses for "under 18,000-lb". The empty weight was 8,930 and when loaded with half the payload, the difference between the GVW and empty weight, the test weight was 16,500.

1. Road

As with trucks already tested, first gear, or low-low, was not used. First gear or low-low is rarely used unless heavily loaded starting uphill or off-road. All driving followed normal driving habit and shift patterns. The odometer reading was 20,812 miles at the beginning and 21,124 miles at the end of the vehicle test sequence. Weather conditions were quite stable throughout the test period with little or no wind or inclement weather. Wet/Dry bulb temperatures and barometric pressures were quite stable.

a. Cold Start Driveaway

All tests were made with a minimum overnight soak of 16 hours before start. Soak temperature was between 65-75°F at night outside for these tests. Engine 3 performed over the cold start driveaway route about as well with either engine configuration. This was the final gasoline powered delivery truck evaluated in this project and it was able to achieve all required speeds with the 16,500-lb test weight. This was demonstrated during the practice run over the course. The power to weight ratio of this truck was quite sufficient to reach the nominal speeds of the procedure. Like trucks 1, 2, 4, and 5, this vehicle was able to operate well at 5 miles per hour above the procedure accel speed. The procedure anticipated this possibility and gave the test engineer the latitude to adjust the top speed + 5 mph depending on vehicle performance.

Since both engine configurations reacted similarly throughout the cold start, both will be described together. The initial starts were mainly routine with 3-0 first start after 5 seconds of cranking while 3-1X started after 2 seconds of cranking with stall after 8 seconds of M rough idle. Another start after 1 second of cranking was more successful. This engine was equipped with automatic choke that resulted in an idle rpm of 1000 rpm (3-1X) and 1600 rpm (3-0) during initial 28 seconds. Although the 3-0 engine quality was satisfactory, Engine 3-1X was rated M rough. After the clearing operation, Engine 3-0 decreased to 500-550 rpm and T rough idle quality for the final 25 seconds of the low idle start sequence. Engine 3-1X, however, idled at 680-700 rpm with a T roughness. The cold start is a fairly important aspect of this test procedure and both had no real difficulty in starting.

The next operation was part throttle accel to 25 mph using 2nd and 3rd gears. For consistency, accels were usually made to 4000 rpm before upshifting. For Engine 3-0, a M stumble was noted. For Engine 3-1X, one stall occurred soon after the initial accel in 2nd gear with a T stretchy operation during the remainder. As the vehicle reached 25 mph, the transmission was upshifted to fourth for the WOT uphill from 25 mph next. Both engine configurations exhibited mostly satisfactory driveaway characteristics with Engine 3-1X having a stall in the 2nd gear acceleration.

The uphill WOT in fourth resulted in a T hesitation for Engine 3-0 and a M hesitation for Engine 3-1X. During the next CT decel and all other decelerations over the driving course, both PT and CT, no exhaust backfires, popping or other exhaust noise was discernible from Engine 3-0. Engine 3-0 was operated using the standard stock muffler whereas Engine 3-1X used a pair of oxidation catalysts but no other muffler or silencer. The exhaust was quite noisy with Engine 3-1X and consistently resulted in a slight to moderate level backfire and general exhaust popping during most CT decels. Backfires were more noticeable and rapid when CT decel from higher engine rpms and when following an accel.

Following the first stop, at which the engine idle speed was a nominal 700 rpm (3-0) and 1500 rpm (3-1X), another PT accel was made to 25 mph. This accel was uneventful in so much as driveability is concerned as no stumble, hesitation, stall or stretchy-lean operation was noted with Engine 3-1X. A T hesitation and a T stumble were noted for Engine 3-0, however. The decel downhill at about 1500-1600 rpm was satisfactory with Engine 3-0, but exhibited a light popping sound with Engine 3-1X.

Next, a WOT accel to 40 mph, 2nd through 4th, was made with both a T hesitation and stumble noted for Engine 3-0 and satisfactory operation recorded for Engine 3-1X. The following downhill decel resulted in some light "pops" in the 3-1X engine configuration. Another PT accel in 2nd and 3rd to 25 mph was then made with T hesitation for Engine 3-0 and T stretchy-lean operation for Engine 3-1X noted. The WOT from 25 to 40 mph in 4th also had a T hesitation for Engine 3-0 and was satisfactory for Engine 3-1X.

The decel from 40 to 25 resulted in 5 loud pops or mild backfires in the exhaust with Engine 3-1X. Both engines had a T stumble in the next condition, a WOT accel from 25 to 40 mph after a brief 25 mph cruise. Again, the CT decel, 40 to 0 mph, resulted in 4 loud pops for Engine 3-1X.

Another PT accel from 0-25 (2nd and 3rd gears) resulted in T stumble (Engine 3-0) and M stumble (Engine 3-1X). These stumbles occurred in 2nd gear and were fairly common though more severe with Engines 2 and 4. The distinct WOT in 4th from 25 to 40 mph also gave a T stumble at the outset of the acceleration for both engines. Satisfactory decel noise was found for both engines during the part throttle (19-20 inch) decel. A WOT from 0 to 25 mph in 2nd and 3rd resulted in a T hesitation and stretchy-lean operation (Engine 3-0) and T stretchy-lean for Engine 3-1X, Both engines PT decelerated to rest in 3rd gear (from about 3500 rpm) satisfactorily. The idle speed was 700 rpm and idle quality was satisfactory for both engines at the conclusion of the first half of the cold start driveaway.

The second half was somewhat better with less hesitation, stumble and stretch ratings due apparently to the warming-up of the vehicle. The PT accel from 0-25 mph produced T hesitation and stumble (Engine 3-0) and T stretchy-lean operation (Engine 3-1X). The next WOT, 25 to 35 mph, gave a T stretchy operation for Engine 3-0 while the decel to rest produced 4 loud pops for Engine 3-1X. The PT to 25 mph gave a T stretchiness as did all the following PT accelerations in 2nd and 3rd during the second half of the run with the controlled Engine 3-1X. A T hesitation was noted during two WOT accels from 25 to 40 mph and in two CT decels from 40 to rest, 4 loud pops were recorded with Engine 3-1X. The PT decels did not produce exhaust backfiring nor did some CT decels at constant engine speed.

The air delivery system used on this engine features a device to bypass the air during CT. Like several other engines in this project, it is doubtful if this bypass sensor was completely operative. These sensors have proven, at least in this project, to be less reliable than say the pump or other components of the air-delivery system. The exhaust noise level with the oxidation catalysts was substantially above the standard or stock configuration 3-0 and both exhaust backfiring or popping and exhaust noise level are items that can be treated satisfactorily by careful design of the system. At no time did either engine surge or stall during the deceleration.

The standard 3-0 configuration performed the remainder of the second half of the cold start driveaway mostly satisfactorily following the initial accel. A T stretchiness was noted during a WOT 25-35 mph uphill accel and a 0-25 mph PT accel. The 0-40 mph WOT accel through the gears gave a T stumble during the initial acceleration in 2nd gear. Otherwise, satisfactory marks were given the last half of the procedure for Engine 3-0. Both engines had satisfactory idle quality at a nominal 700 rpm idle speed at the conclusion of the procedure.

In summary, both controlled Engine 3-1X, and baseline, Engine 3-0, equipped vehicles performed mostly satisfactorily over the cold start driveaway procedure. A number of T or trace ratings were given both engines during the test indicating that stumble, hesitation, and stretchy-lean operation were evident from both occasionally, but just barely detectable. Sometimes at the T level, it is difficult to judge whether the engine-vehicle exhibited hesitation or stretchy-lean operation since both can occur and may occur during the same driving condition or acceleration, though at different times. It seemed that as the engine and vehicle warmed-up, the stretchy-lean type of PT accel driving quality deficiency became more evident with Engine 3-1X. Both engines were about the same the first time around the test course and Engine 3-1X stretchiness became more evident during the second half of the test while Engine 3-0 driveability improved slightly. Both engines, however, exhibited mostly acceptable driveability and no particular fault was found with either configuration.

b. Warm Driveability

Once the vehicle was thoroughly warmed up, a series of level road load manifold vacuum readings were taken both ways over a level course. The results are shown as follows for the vehicle powered by 3-0 and 3-1X.

Speed mph	Engine rpm	Trans Gear	Manifold Vacuum, in Hg 3-0	Manifold Vacuum, in Hg 3-1X
20	2300	3	17.0	14.4
30	3300	3	14.8	13.9
40	2500	4	11.3	9.2
50	3200	4	8.9	7.2
60	3850	4	6.2	4.8

The controlled configuration, Engine 3-1X, required more throttle depression throughout the 20 to 60 mph range than the standard 3-0 engine and this was indicated by the lower manifold vacuum readings for 3-1X listed above. As with other engines equipped with EGR and air pump (3 in this case), the differences in manifold vacuum for the same road speed and load appear nominal. The pair of oxidation catalysts used with 3-1X instead of the standard muffler (3-0) imposed about the same backpressure on the engine as usual so this was not considered a factor in performance. The 50 mph values are the only data of use directly in the chassis runs for setting road load. The driveability under cruise conditions was rated satisfactory.

The warm driveability procedure includes a number of PT WOT accels and PT, CT decels. The WOT accels from 25 to 40 mph in 4th gear with rapid or slow throttle opening always gave a T stretchiness for both baseline and controlled engine. In addition, a T hesitation was noted during the rapid opening accel for Engine 3-0.

Decels from 40 mph at CT and PT produced differing exhaust noise levels as in the cold driveaway. No abnormal noise issued from 3-0 but 3-1X continued to produce several moderate to loud pops or light backfires during CT deceleration. PT decels were not accompanied by this noise. At no time did either engine stall, surge or otherwise operate unusually during any CT or PT deceleration mode regardless of the previous running speed or load.

A series of three PT accels, at 11, 8, and 5 inches of intake vacuum, were then run. These are probably the most critical and revealing of the procedure as it relates to EGR operation. While Engine 3-0 received satisfactory drive quality for these tests, the controlled Engine 3-1X produced a consistent T stretchiness indicative of the lean type operation. The EGR system is operative more or less at all three PT settings and is considered the reason for this slight but noticeable (T) difference in the two engines. The type of stretchy running was quite similar to some EGR equipped automobiles.

Next, a series of crowd type accels were made at "light", "moderate", and "heavy" crowd rates of accelerator opening. A T stretchiness was noted for both engines although the stretchy operation lasted longer for Engine 3-1X than 3-0. For example, a T stretchy-lean condition occurred between 8-12 inches Hg vacuum during the moderate crowd. If it occurs at all and is noticeable, the condition is rated. If it occurs for a longer or shorter period is not necessarily reflected in the ratings as they are mostly quality, not quantity evaluations.

After several WOT accels, the engine was allowed to idle 30 seconds and then was shut off. Engine 3-0 idled smoothly at 710 rpm and 3-1X idled at 690 rpm. The idle quality was satisfactory. After engine ignition shut-off, the engine did not after-run. This was true of both engine configurations. After the 15 minute soak period, the engine restarted easily and idled with a satisfactory quality at 600 rpm (Engine 3-0) and 620 rpm (Engine 3-1X). The engine was then turned off again with no after-run noted for either engine.

In summary of the warm driveability phase of the testing, both engines operated satisfactorily. As in the cold start phase, no detonation or fuel deficiency was noted and neither engine resulted in any noticeable stumble or surge. Both engines seemed to operate properly but controlled Engine 3-1X seemed to have more stretchy-lean operation principally during PT accelerations. Operation at CT decel was accompanied by some exhaust backfiring with Engine 3-1X, a condition that can be eliminated by design.

c. Vehicle Performance

The final portion of each driveability series was a series of accelerations from 0-20, 0-40, and 0 to 60 mph on level road at WOT. The times and distances required to reach 20, 40, and 60 mph from rest and the 20 to 50 mph accel are listed on the next page. The data indicates Engine 3-1X, the controlled configuration, to have poorer accel performance than the uncontrolled Engine 3-0. The difference increased as accel top speed increased and was most pronounced at the 0-60 mph and 20-50 mph runs. These differences were mentioned earlier as being

Engine	Configuration		Accelerations, mph 0-20	0-40	0-60	20-50
3-0	"Uncontrolled"	Time, sec	7.4	25.5	64.8	33.4
		Dist, miles	0.024	0.181	0.766	0.368
3-1X	"Controlled", EGR, O-Cat, Air	Time, sec	7.8	27.6	73.1	36.3
		Dist, miles	0.025	0.200	0.852	0.394

probably attributed to the exhaust system and the use of dual air pumps with Engine 3-1X relative to the baseline Engine 3-0.

To learn more of the differences in engine exhaust backpressures as they may have affected the engine, measurements were taken on the chassis dynamometer at various engine speeds and rear wheel loads. They are listed below for comparison purposes.

Vehicle mph	Engine rpm	Gear Position	Rear Wheel Power Out, Hp obs 3-0	3-1X	Exhaust Backpressure inches water 3-0	3-1X
50	3200	4th	65	59	21	29
40	2600	4th	39	36	11	15
30	2000	4th	23	21	4	8
20	1300	4th	12	11	0	3
40	4400	3rd	38	35	20	28
30	2200	3rd	23	21	9	14
20	1200	3rd	12	11	2	3

The oxidation catalyst exhaust system imposed roughly 40 percent more backpressure on the engine, control configuration 3-1X, than the uncontrolled 3-0 baseline engine with the standard stock muffler and exhaust system. Exhaust backpressures are not considered excessive for either engine though it is reasonable to assume that a suitable exhaust system design would result in exhaust restrictions comparable to the stock muffler. What impact the different backpressures had on vehicle performance is unknown since both engines had fairly low exhaust backpressure.

The WOT accels for Engine 3-0 were characterized by T to M stumble in 2nd gear with occasional T to M hesitation and lean-stretchy operation. Engine 3-1X exhibited similar quality of driveability with mostly satisfactory operation and sometimes a T stretchiness. No surge was noted at any time nor was any fuel deficiency apparent through engine detonation, knock, ping, or rattle. If this or any other similar faults were with either engine, they would have been found during the gradeability test. The following are average times, distances and speeds attained.

Engine	Configuration	Distance Miles	Max Speed, mph	Ending Speed, mph	Time Required, Seconds
3-0	"Uncontrolled"	1.078	59.5	50	87.6
3-1X	"Controlled", EGR, O-Cat, Air	1.079	56	46	90.5

The replicate accels repeated nicely with satisfactory driving qualities except for T stretchiness with Engine 3-1X. As during the other acceleration tests, the performance of Engine 3-1X was less than 3-0. Note the max speed and final speed attained over the nominal 1.075 mile course and the slightly longer time for 3-1X to make the distance.

The major conclusion of these tests was that Engine 3-1X lacked some of the performance of Engine 3-0 probably due to the combined effect of the EGR system, dual air pump oxidation air system, and possibly due to increased exhaust backpressure (due to the oxidation catalyst system). Compared to other trucks tested in this project, the performance during acceleration and grade type tests was outstanding. The general driveability and performance was quite satisfactory and considered acceptable even with the emission controls added.

d. Catalyst Temperature

The fourth portion of the road test procedure involved operating the catalytic muffler equipped truck for 5 minutes at 60, 50, and 40 mph in 4th gear while recording the catalyst outlet temperatures from each oxidation reactor on 10 second intervals. These temperatures are summarized on Table 22 and the max, min, and arithmetic average value indicated at the bottom.

Occasionally the inlet exhaust gas temperature to the oxidation catalyst was checked and found to be somewhat lower than the outlet temperature. The maximum, minimum, and average of the before oxidation catalyst temperatures are at the bottom of Table 22. The outlet temperatures averaged about 150°F higher than the inlet temperature at 50 and 60 mph. The average oxidation catalyst outlet and inlet temperatures, shown in Table 22, were similar to that found in the stationary dynamometer operation. At no time during any of the road

TABLE 22. CHASSIS OPERATED ENGINE 3-1X
OXIDATION CATALYST TEMPERATURES (4TH GEAR)

	60 mph Cruise		50 mph Cruise		40 mph Cruise	
Min:Sec	Left	Right	Left	Right	Left	Right
After Oxidation Catalyst						
0:0	1800	1740	1620	1600	1210	1200
0:10	1800	1740	1600	1600	1220	1200
0:20	1820	1740	1550	1540	1220	1200
0:30	1830	1740	1500	1540	1220	1200
0:40	1840	1740	1460	1480	1220	1210
0:50	1820	1740	1440	1440	1220	1210
1:00	1800	1740	1460	1490	1230	1220
1:10	1800	1740	1500	1500	1230	1220
1:20	1790	1740	1540	1560	1220	1220
1:30	1780	1720	1560	1550	1200	1200
1:40	1790	1740	1580	1570	1200	1190
1:50	1790	1740	1600	1600	1190	1150
2:00	1810	1750	1600	1600	1180	1170
2:10	1810	1740	1580	1580	1170	1160
2:20	1780	1740	1560	1540	1170	1160
2:30	1780	1740	1550	1540	1170	1160
2:40	1790	1740	1560	1540	1180	1160
2:50	1780	1720	1560	1550	1180	1160
3:00	1760	1700	1580	1560	1180	1160
3:10	1740	1720	1560	1550	1190	1160
3:20	1740	1720	1540	1520	1180	1170
3:30	1760	1740	1550	1500	1190	1170
3:40	1740	1740	1500	1500	1190	1160
3:50	1760	1740	1480	1460	1200	1170
4:00	1780	1740	1500	1500	1200	1170
4:10	1770	1760	1550	1550	1200	1170
4:20	1780	1770	1560	1560	1200	1170
4:30	1800	1770	1570	1560	1200	1180
4:40	1800	1760	1570	1570	1200	1180
4:50	1820	1780	1590	1590	1200	1190
5:00	1800	1780	1600	1600	1200	1190
Avg	1789	1742	1547	1543	1199	1182
Max	1840	1780	1620	1600	1230	1220
Min	1740	1700	1440	1440	1170	1150
Before Catalysts						
Avg	1631	1554	1336	1242	1216	1132
Max	1640	1580	1450	1320	1260	1180
Min	1610	1540	1240	1160	1180	1100

operation did the catalyst bed temperatures exceed 1840°F. The maximum continuous oxidation catalyst outlet temperature recommended by the manufacturer was 1800°F.

2. Chassis Dynamometer

Nine-mode and transient LA-4 type 1975 FTP chassis dynamometer tests were conducted with Engine 3.

a. Nine-Mode FTP

The plan of test was to perform replicate nine-mode FTP tests per the 1970-1973 test procedure immediately after engine installation for comparison with the final stationary baseline tests on the engine. The average results are summarized in Table 23 and show satisfactory correlation of the stationary to chassis engine operated emissions for HC and NO. CO was substantially higher when the engine was operated in the chassis by the chassis dynamometer simulated FTP. The major difference was in the 3-inch vacuum condition, mode 7, which was consistently higher for the chassis runs. The chassis 3-inch CO was 4.7 percent versus the 2.7 percent average for the stationary runs, although the reason for this difference is unknown, it is believed to be a function of power valve staging. There were no obvious differences in how the tests were made that would account for this increase.

TABLE 23. ENGINE 3-0 STATIONARY AND CHASSIS NINE-MODE FTP

			NDIR Instrument Results		
Dynamometer	Test	Run	HC, ppm Hex	CO, %	NO, ppm Corr.
Stationary 8-24-73	79	1	148	0.90	1013
		2	121	0.94	1000
		3	144	0.90	992
Average			138	0.91	1002
Chassis	1	1	135	1.44	1145
		2	141	1.55	1129
Average			138	1.50	1137

The above validates the removal and subsequent installation of Engine 3-0 in the vehicle without modifying the HC and NO emissions behavior of the baseline engine. Except for the higher CO during the 3-inch mode, the chassis modal CO compared well with the stationary modal CO emission concentrations.

b. 1975 Light Duty FTP

For purposes of the 1975 FTP (LA-4) run, a nominal 16,000-lb inertia simulation was used, the same as used with trucks 2 and 4. The level road load at 50 mph was 65 hp at rear wheels for engine 3-1 and 59 hp for engine 3-1X. All tests were made starting in second and upshifting to third at 15 mph as specified and to fourth at 30 instead of 25 mph as specified. Other shift patterns were investigated and this seemed as good or better than others and made the truck operate more as it might on the road. Upshift engine rpm at 15 mph was 3500 rpm and at 30 mph it was 3200 rpm.

Table 24 is a summary of the results by engine configuration. The emission rates are all based on 7.5 miles of driving, the length specified in the Federal Register. The fuel consumption values are based on the actual net fuel used and the measured (5th wheel) miles traveled for the two distinct driving segments, the 23 minutes cold cycle and the 505 seconds hot cycle. The measured distance for the 23-minute test is usually less than 7.5 miles, but in these tests with 16,000-lb inertia, the distance was always in excess of 7.5 miles. The reason for the higher mileage was inability of the truck to stop as rapidly as specified by the LA-4 test in addition to the truck's ability to accel more closely to the requirements than some other, lower power to weight, trucks.

TABLE 24. 1975 FTP TRANSIENT EMISSION RATES - ENGINE 3

Engine Code	Test Configuration	Test No.	Grams per mile			Fuel Cons, mpg	
			HC	CO	NO_x	23 min	505 sec
3-0	"Uncontrolled	3	17.4	290.9	6.10	5.41	5.32
		4	15.7	246.8	5.88	5.26	5.45
	Average		16.6	268.9	5.99	5.34	5.39
3-1X	"Controlled"	1	2.9	110.1	4.30	4.83	5.15
	EGR, O-Cat, Air	2	2.3	107.5	4.69	4.60	5.30
	Average		2.6	108.8	4.50	4.72	5.23
Percent Reductions, $\frac{\text{3-0 Minus 3-1X}}{\text{3-0}}$ X 100%			84	60	25	11.6	3.0

The average 5th wheel distance for the 23 minute run was 7.781 miles (7.783 miles Engine 3-0, 7.779 miles Engine 3-1X). The average distance for the 505 second run, after 10 minute soak, was 3.701 miles (3.714 miles Engine 3-0, 3.689 miles Engine 3-1X). These are slightly higher than would be observed if the truck could have stopped as quickly as a 4000-lb car or even say a truck operating with 10,000-lb inertia. It is difficult to get the truck to stop using only the truck's rear wheel brakes. It would be possible to achieve better deceleration rates given a braking type dynamometer or one that had external braking capability. In the event the 23 minute LA-4 fuel consumption is desired, on a 7.5 mile basis, the mpg values can be multiplied by 0.964 (7.5/7.781). The 7.781 and 3.701 mile measured distances for engine-vehicle 3 may be compared with engines-vehicles 2 and 4, similar power to weight and inertia simulated vehicle tests. The fuel consumption or mileage values given in the table are based on fuel with 0.747 gm /cc (6.233 lbs/gal) density.

From the grams per mile baseline values for Engine 3-0 by the modified 1975 FTP, HC and CO emissions were reduced by the EGR-oxidation catalyst system which comprised Engine 3-1X. An 84 percent reduction in HC, from average of 16.6 to 2.6 grams per mile, and a 60 percent reduction in CO, from 268.9 to 108.8 grams per mile, were obtained. NO_x was also reduced, by 25 percent, from 5.99 grams to 4.50 grams per mile.

It is thought that these rather high levels of CO and low levels of NO_x were a function of how the engine had to be operated on the transient LA-4 test schedule. The majority of the time, the accelerator pedal was either in the WOT, CT or idle position. Although this vehicle's power to weight ratio allowed as good or better operation over the LA-4 schedule, the vehicle required a substantial amount of WOT accel or CT decel and both modes, especially the WOT, produce the greatest quantities of CO, for example. Copies of the computer reduced data for the four 1975 FTP tests made with this engine are included as Tables C-54 to C-57 of Appendix C. Please refer to these print-outs for more details on this test series.

D. Summary

In summary of this section, a series of stationary dynamometer tests with Engine 3 were conducted to determine the extent to which HC, CO, and NO_x could be reduced by available control technology. The experiments involved use of oxidation catalyst, dual air pump air injection system and an EGR system as supplied by the manufacturer and as modified by SwRI as a result of these experiments. A brief series of tests were made with the emission control system described on page 81. This system was intended for stationary engine tests only and in simulated tests reduced HC, CO and NO_x over 95 percent.

The system selected for chassis evaluation was the dual air pump, dual oxidation catalysts (one per bank) and a slightly modified factory automatic EGR system. As shown in Table 25, this gave on the order of 90 percent reductions in HC and CO and 35 percent reduction in NO_x

TABLE 25. SUMMARY OF ENGINE 3 RESULTS

Stationary Results

Engine		Grams/Bhp-Hr					Cycle
		HC		CO	NO_2		BSFC,
No.	Description	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
		9-Mode FTP					
3-0	1973 Std.	4.0	5.3	36.7	7.1	6.8	0.73
3-1X	O-Cat, Air, EGR*	1.3	0.3	4.3	4.5	4.2	0.89
		9-Mode EPA					
3-0	1973 Std.	3.3	4.8	36.0	6.1	5.7	0.67
3-1X	O-Cat, Air, EGR*	1.2	0.2	2.8	4.0	3.5	0.80
		23-Mode Exp.					
3-0	1973 Std.	-	10.2	94.1	-	4.5	0.71
3-1X	O-Cat, Air, EGR*	-	0.6	13.7	-	2.9	0.73

Chassis Results

9-Mode Chassis

Engine No.	Description	HC ppm Hex.	CO %	NO (Corr) ppm
3-0	1973 Std. Stationary	138	0.91	1002
	Chassis	138	1.50	1137

1975 LD FTP (LA-4 Mod)

Engine		grams/mile			Fuel Econ, mpg	
No.	Description	HC	CO	NO_x	23 min	505 sec
3-0	1973 Std.	16.6	268.9	5.99	5.34	5.39
3-1X	O-Cat, Air, EGR*	2.6	108.8	4.50	4.7	5.23

Summary

Test	Percent Reductions			
Procedure	HC(FID)	CO	NO_2(CL)	Fuel Cons.
9 Mode FTP	94	88	38	(22)
9 Mode EPA	88	92	39	(19)
23 Mode Exp.	94	85	36	(3)
1975 LD FTP	84	60	25	(9)

( ) means increase

*EGR with restrictor

regardless of test procedure. Fuel consumption, according to the weighted brake specific values, could increase as much as 20 percent, however. Reductions in HC, CO, and NO_x were found during the transient tests by the 1975 FTP light duty test. The percent reductions were trendwise the same but slightly less than the stationary test results mainly due to the predominately WOT operation with 16,000-lb inertia on the LA-4 driving schedule. These results and percent reductions are also summarized in Table 25.

A series of chassis tests to determine cold start driveaway, warm driveability and acceleration performance were made with the engine in baseline and control equipped configurations. The major finding was that both engines responded under loaded vehicle conditions with about equal driveability under cold start and warm conditions. More stretchy-lean operation was evident, especially at part throttle accelerations with the EGR equipped truck. Some difference in general performance was noted with the controlled engine such as during the accelerations to 40, 50, and 60 mph and the uphill grade performance. The control equipped truck was slightly slower than the baseline truck. The dual air pumps, EGR and possibly a higher exhaust backpressure with the controlled engine could account for most of this difference.

VI. ENGINE 4 RESULTS (345 CID GASOLINE)

Engine 4 was a new 1973 California model with the same emission control hardware as provided to the Bureau of Mines for durability testing(40).

A. Engine Preparation

A 25-hour run-in of the engine as received was performed. The run-in did not include the EGR, air pump and air injection system and decel demodulator provided on the engine. Subsequent to the run-in, the WOT performance of the engine was checked and a power curve obtained. Performance of the engine was found to meet the manufacturer's specifications. The engine was then modified to a 1972 Federal baseline requiring a different carburetor and distributor. The 1972 baseline was identified as 4-00. Engine 4-0 was the 1973 California baseline configuration as adopted from the 1972 baseline. The 1973 California engine uses the carburetor, distributor, 5 percent EGR, and decel demodulator originally received with the engine.

The controlled configuration was designated 4-1 and basically utilized the 4-0 Engine along with 10 percent EGR, air pump for air injection into the exhaust manifolds, and a pair of oxidation catalysts. The oxidation catalysts used with this engine were precious metal in a pellet substrate.

The function of the decel demodulator was to hold the throttle open to an equivalent engine idle speed of 1300 to 1400 rpm. During a closed throttle operation, at an approximate engine speed of 1850 ± 50 rpm, the demodulator was set to cut out and allow the throttle to close. More discussion of the decel demodulator is presented under Section XI.

B. Stationary Operated Results

A total of 27 runs were performed with the engine employing the nine-mode FTP, nine-mode EPA, and 23-mode EPA procedures. Each procedure was used in three runs made in every configuration of the engine specified for test. The computer printouts for the resultant emission tests are shown in Appendix D. Included in Appendix D are various summaries of composite emissions for Engine 4.

1. FTP Nine-Mode Results

A summary of the nine-mode FTP results with Engine 4 is presented in Table 26. When compared against the 1972 baseline engine emission values, the 1973 California engine exhibited lower emissions

TABLE 26. NINE-MODE FTP EMISSIONS SUMMARY FOR ENGINE 4

Engine		Average Composite Emissions, Grams/Bhp Hr					Cycle BSFC,
		HC		CO	NO_2		
No.	Configuration*	NDIR	FID	NDIR	NDIR	CL	lb/Bhp Hr
4-00	1972 Standard	6.3	8.6	63.2	8.8	8.2	0.71
4-0	1973 Calif.	4.3	5.6	56.3	6.4	5.7	0.79
4-1	EGR+AIR+CAT	1.0	0.7	6.2	5.6	5.2	0.85
Percent Reduction, 4-00 to 4-0		32	35	11	27	30	(11)
Percent Reduction, 4-0 to 4-1		77	88	89	13	9	(8)

---

*1973 California engine included EGR with 5 percent pintle.
( ) means increase.

in all categories. Composite HC by NDIR was reduced by 32 percent and composite NO_2 by NDIR showed a 27 percent reduction. Overall, the reduction of HC-NDIR and CO emissions was more pronounced with the controlled configuration. Compared against the 4-0 Engine, for example, the HC by NDIR was reduced by 22 percent and the CO by 89 percent. Reduction of NO_2 by NDIR was 13 percent with the controlled engine. With respect to the NO_2 emissions in Table 26, it is interesting to note that an earlier Bureau of Mines study(16) on a similar engine also indicated the greater reduction of NO_2 occurred with the 5 percent valve pintle with less incremental improvement noted when using a 10 percent pintle.

Fuel consumption, as seen in the BSFC column of Table 26, increased by 11 percent with Engine 4-0. The penalty was less for Engine 4-1 relative to 4-0. In this case, there was an 8 percent increase in BSFC. The increased BSFC seems consistent with other similarly controlled engines. The oxidation catalyst was the reason for the major improvements with the 10 percent EGR valve pintle showing only an incremental improvement on NO_x relative to the 5 percent pintle.

2. EPA Nine-Mode Results

A summary of results for Engine 4 using the EPA nine-mode procedure is shown in Table 27. Overall, the composite emissions for the three engine configurations were similar to corresponding FTP nine-mode composite emissions in Table 26. The similarity is made especially clear in Tables 26 and 27 by the percent reduction of emissions for the 1973 California engine.

TABLE 27. NINE-MODE EPA EMISSIONS SUMMARY FOR ENGINE 4

		Average Composite Emissions, Grams/Bhp Hr					Cycle
	Engine	HC		CO	NO_2		BSFC
No.	Configuration*	NDIR	FID	NDIR	NDIR	CL	lb/Bhp Hr
4-00	1972 Standard	5.7	7.9	63.9	8.8	8.4	0.68
4-0	1973 Calif.	3.6	5.3	56.1	6.1	5.7	0.73
4-1	EGR+AIR+CAT	1.1	0.5	3.6	6.2	5.9	0.72
Percent Reduction, 4-00 to 4-0		37	33	12	31	32	(7)
Percent Reduction, 4-0 to 4-1		69	91	94	(2)	(4)	1

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*1973 California engine included EGR with 5 percent pintle.
( ) means increase

Two noticeable differences were noted in the EPA nine-mode and FTP nine-mode emissions levels. The composite CO of the controlled engine by the EPA nine-mode was 42 percent lower than by the FTP nine-mode test. Also, whereas the FTP nine-mode NO_2 emission rate was decreased by 13 percent (NDIR) with Engine 4-1, the NO_2 emission rate was essentially unchanged when tested by the EPA nine-mode.

BSFC was consistently lower by the EPA nine-mode test than by the FTP nine-mode test by 4 to 15 percent. Essentially no change in BSFC was noted for the controlled engine compared to the 1973 California engine in the EPA nine-mode results.

3. EPA 23-Mode Results

The EPA 23-mode results are shown in Table 28. Composite emissions of HC-FID and CO with all engine configurations are seen to be generally higher than those by the FTP and EPA nine-mode tests.

TABLE 28. EPA 23-MODE EMISSIONS SUMMARY FOR ENGINE 4

Engine		Average Composite Emissions, Grams/Bhp Hr					Cycle BSFC, lb/Bhp Hr
		HC		CO	NO_2		
No.	Configuration*	NDIR	FID	NDIR	NDIR	CL	
4-00	1972 Standard	---	8.4	91.6	---	6.1	0.69
4-0	1973 Calif.	---	11.6	95.9	---	4.8	0.70
4-1	EGR+AIR+CAT	---	0.9	15.1	---	4.5	0.75
Percent Reduction, 4-00 to 4-0			(38)	(5)			(1)
Percent Reduction, 4-0 to 4-1			92	84			(7)

---

*1973 California engine included EGR with 5 percent pintle.
( ) means increase

Conversely, the NO_2-CL emission data on NO_2-CL for the same engines are lower than those by the FTP and EPA nine-mode tests. This bears out the fact from previous experience that the nine-mode FTP is a ''higher NO_x producing engine exercise than the 23-mode test.

Unlike FTP and EPA nine-mode results, the 1973 California engine in the EPA 23-mode evaluation produced higher HC-FID and CO emissions than the 1972 standard baseline. This has happened before in this and the previous program where a reversal in improvement is noted for the 23-mode versus the nine-mode tests. HC by FID increased 38 percent and CO increased 5 percent with the 1973 California engine. However, the controlled engine did show significant HC and CO reduction with respect to 4-0. HC by NDIR decreased by 92 percent and CO decreased by 84 percent. The largest reduction in NO_2-CL emissions, 21 percent, occurred using the 1973 California configuration. The controlled engine produced an additional reduction of 6 percent in NO_2. Here, as was also the case with FTP and EPA nine-mode tests, the increased EGR rate, from 5 to 10 percent pintle, yielded less incremental improvement or reduction in NO_2. Composite BSFC was lower for the EPA 23-mode than for the FTP nine-mode by 3 to 12 percent and is likely due to the different range and number of operating conditions as well as weighting factors for the two engines.

4. Discussion of Data

In review of the entire 27 runs, as contained in computer printouts and run by run listings in Appendix D, it may be said that the engine ran satisfactorily and that the run to run modal results and composite values repeated acceptably. Some interesting points were resolved or extensively studied just before or in the course of Engine 4 testing.

One item was the slight but fairly consistent difference between NO measured by NDIR and NO_x measured by CL of from 15 to 75 ppm. The CL was consistently lower by this small amount when analyzing simultaneously the same raw exhaust. This was noticed during Engine 5 testing. Before starting Engine 4, the difference was confirmed as real. Suffice to say that in the course of almost two weeks of investigation of all parts of sampling, handling, preparation and, of course, the NDIR and CL analyses themselves, the difference was found to exist. This is in general agreement with the findings in EPA project EHS 70-110(6) where the NO_x by CL over the range of 0 to 2500 ppm was consistently equal to or lower than the NO by NDIR.

This finding is in general agreement with that found for diesel raw exhaust although the agreement is thought to be still better for gasoline engines than the diesel. Accordingly, it should not be of concern on Engines 4 and 5 and the other engines to find the NO_2 rates by CL to be slightly lower than by NDIR. It is a fact, insofar as can be determined under the scope of this project. This is one more indicator of the need to conduct sufficient R&D of the instrumentation required for raw exhaust analysis by CL. If there is a serious expectation of its use in this application, steps should be taken to investigate the potentialities of a lightly heated CL and to determine why NDIR and CL readings do not agree completely.

Another item of interest, studied during the course of Engine 4 stationary testing, was the apparent lack of repeatability of the idle emissions. After running a number of modal tests, it was established that the idle emissions were quite susceptible to the previous mode or modes of operation and that there was indeed a "history" effect. This was of major concern during the 23-mode test where an idle was run at the start, in the middle after a WOT condition, and at the end after a light or no load high speed condition. The procedure was formulated to be able to handle this effect, but it was felt that the differences in idle emission should be verified separately which they were.

The decel modulator system was cause of substantial interest and concern both over its operation and adjustment, although more will be given on this in Section XII. The susceptibility of the modulator valve, which holds the carburetor throttle plate open, was found to be very sensitive to the throttle return spring force. Great care had to be used to apply enough spring tension for safe and proper throttle-carburetor operation but not so much so that the demodulator valve was overridden during closed throttle and the throttle plate closed completely or to some point between the position corresponding to 1300 to 1400 rpm high idle (desired) and low idle. Hydrocarbon emission rates were quite sensitive to this adjustment; and to make sure the spring tension was not excessive, the adjustment would be checked by running closed throttle and noting the NDIR HC concentrations. A nominal 100 ppm was reached relative to a normal 2500 Ppm n Hexane at 2000 rpm.

During the stationary testing, reductions (though slight to moderate) in HC, CO, and NO_2 were found by the nine-mode FTP for the 1973 California versus the 1972 Federal configuration of Engine 4 without an overly excessive increase in BSFC. Of concern is the fact that neither configuration of this engine met the 1973 California (1974 Federal) heavy duty emission standards for CO of 40 gr/hp-hr, although below the 16 gr/Bhp-hr combined HC + NO_2 limit. By use of an oxidation catalyst and more EGR, the nine-mode FTP CO is substantially below the 30 gram limit for 1975 (California) and HC + NO_2 of 6.6 is below the 10 grams 1975 California standard adopted in November 1973.

Although the nine-mode EPA results showed much the same results, it appears that use of the EGR valve with 5 percent pintle was as good as the 10 percent pintle. The 23-mode HC and CO test results for the 1973 California configuration of the engine were higher than the 1972 version. This is a reversal of that found by the nine-mode procedure and is not particularly surprising in view of some previous engine test results. Otherwise, the oxidation catalyst was responsible for the substantial reductions in HC and CO with only an incremental improvement in NO_2 found when using the 10 percent pintle instead of the 5 percent pintle equipped EGR valve. Weighted BSFC seemed affected some, 7 percent, by the 23-mode test. In no instance was EGR allowed at WOT so that the maximum power of the engine was not affected by the control equipment except for the loss due to the air injection pump.

C. Chassis Operated Results

The engine was installed in a conventional 2 axle 1972 IHC model 1600 Loadstar van type delivery truck, license CG2451, ABC number 757. The empty weight was 10,790 lbs and the gross vehicle nameplate weight was 22,500 lbs. Using half payload as the criteria, the test weight was 16,645 lbs and was accomplished by adding 12 drums of water. The tire size was 9.00-20 and the driveline was a five-speed transmission with a two speed rear axle. The van box was 18 ft long, 8 ft wide and 7.5 ft high. The odometer reading was 17,022 miles at the beginning and 17,327 miles at the end of the vehicle test sequence.

1. Road

As with truck number 2, which was a similar heavy duty delivery truck with 5 forward speed transmission and two speed rear axle, vehicle 4 was found to operate most acceptably on the road and on the dynamometer in the high axle position and, as usual, 1st gear was not employed. As explained in earlier reports, 1st gear is low-low and is rarely used unless heavily loaded starting uphill or off-road. All driving followed normal driving habit and shift patterns except only hi-axle position was employed. Weather conditions were quite stable throughout the test period with little or no wind or inclement weather. Wet/Dry bulb temperatures and barometric pressures were quite stable.

a. Cold Start Driveaway

All tests were made with a minimum overnight soak of 16 hours before start. Soak temperature was 75°F inside of the air conditioned Emissions Laboratory with the vehicle rolled outside before start. Please refer to Appendix M-6 for the test procedure and map of the route employed. The tests were performed in duplicate.

Starting time was an average of 3.5 seconds for 4-0 and 5.5 seconds for 4-1 with trace rough idle during initial 28 seconds at fast idle of about 900 rpm, engine 4-0 and 600 rpm, engine 4-1. The manual choke was used and pulled completely out and then pushed back to the 3/4 choke position for each start per manufacturers directions. Both cold starts with Engine 4-1 involved a stall, one after about 12 seconds of idle requiring restart, and the other during the rapid engine accel-clearing step.

After the clearing operation, the idle speed would continue as during the initial 28 second period and the last 5 seconds with clutch disengaged but the idle quality would improve to a satisfactory rating for Engine 4-1 but remained T rough for Engine 4-0. This initial start and idle period is critical in this procedure from a startability standpoint and it must be concluded that both engine configurations had about the same extent of minor problems and neither engine seemed to start or idle better than the other. Although not particularly repeatable, the start-idle sequence, overall, is judged acceptable.

The next portion is the cold driveaway acceleration to 25 mph from 2nd to 4th at PT, another important part of the sequence. Engine 4-1 had T to M stumble in 2nd gear followed by T hesitation in 2nd with T stretchy operation in 3rd. This type of operation has been normal in other trucks thus operated and was not considered abnormal.

After a brief cruise at 25 mph in 4th, a WOT up a slight incline to 35 mph followed by CT decel to rest was made. Both engines exhibited T hesitation and T stretchiness in the WOT accel and Engine 4-1, with the dual oxidation catalysts and no exhaust muffler, had an excessive amount of exhaust noise, especially some moderate backfires, just at the start of the decel.

After the stop, at which time the choke was decreased to 1/4-1/2 choke, another PT accel to 25 mph was made. During the brief idle at the stop, the idle speed was 700 rpm. Idle quality was judged satisfactory. The 0-25 mph PT accel resulted in a T stumble for both engines. Probably the "cold" engine and the previous CT decel had some effect but both Engines 4-0 and 4-1 performed the same.

After a brief cruise at 25 mph, 4th gear, a relatively long downhill CT at essentially constant 1600 rpm was made. Some light backfires were noted at the start of the decel with a continuous popping noise noted during the remainder of the CT with Engine 4-1. Engine 4-0 was satisfactory. Another brief idle, less than 10 seconds, ensued at which time the choke was discontinued and 700 rpm satisfactory idle quality was noted.

A WOT accel to 40 mph, 2nd to 4th, was then made with M stumble found for Engine 4-0 and T stumble followed by T hesitation and then T stretchy-lean noted during final part of this acceleration. Both engines overall performed about the same.

During the following CT downhill deceleration, where about 2300 rpm engine speed was held, it was found that both engines tended to decel at a much slower rate. The engine speed, and hence the vehicle speed, did not decrease in the same way as other trucks operated over the course which were not equipped with the decel throttle modulator device which is standard equipment for this engine sold in California in 1973. This device was described and discussed earlier in this section.

This was the first driving experience with the decel device and it resulted in a prolonged decel, a very slow rate from 2300 rpm to about 1900 rpm (30 mph, 4th) at which time the engine rpm would rapidly drop and the vehicle speed likewise rapidly dropped as with the other trucks tested. This action of the throttle modulator was observed repeatedly thereafter when decelerating from an engine speed above about 2000 rpm. The net effect on driveability is to make the vehicle keep going for about 2 seconds more than normal and to greatly lengthen the initial time of deceleration (lessen the rate of decel). This requires the driver to have a different, possibly a quicker, reaction time. There was little doubt that the decel modulator, by holding open the throttle plate until the engine speed finally drops below about 1850 to 1900 rpm, causes increased brake application and may result in shorter brake life. The driver cannot expect as much engine braking effect from higher speeds and must rely more on the vehicle brakes to stop.

The next operation involved a PT accel to 25 mph in 4th, followed by a WOT in 4th from 25 to 40 mph followed immediately by a CT to 25 mph in 4th. Engine 4-0 had T stumble and 4-1 had M stumble in the 0-25 mph. The WOT in 4th resulted in Engine 4-1 having T stretchiness while Engine 4-1 was satisfactory both in the WOT and following decel. Engine 4-1 continued to have moderate exhaust noise, light backfires, moderate popping, especially above 2000 rpm.

Engine 4-0 had a T hesitation in the next WOT from 25 to 40 in 4th while Engine 4-1 had a T stretchiness. The following CT decel, like others, was satisfactory for Engine 4-0 with light to moderate exhaust noise (popping) found with Engine 4-1 and the tendency to not slow down like normal. Another PT from 0-25 followed by a WOT in 4th from 25 to 40 mph, uphill, resulted in T stretchiness ratings for Engine 4-1. Engine 4-0 was satisfactory. A PT decel was then made, uphill, from 40 to rest in 4th and no exhaust noise was noted from either engine at the approximate 19 to 20 inch vacuum condition simulated.

A final WOT accel to 25 mph in third was made uphill followed by another CT decel to rest. A T stumble was noted for Engine 4-0 while Engine 4-1 had a M stumble. The final PT decel to rest again had little or no exhaust noise and was quite acceptable. The final idle of the first part of the cold driveability test was satisfactory and about 700-740 rpm.

After the 30 second idle period, the course was run again just as the first round except no choke was used. The driveability of the truck with both engines improved measurably, probably due to the warming-up of the vehicle. Engine 4-0 was given satisfactory ratings in all steps except two PT accels from 0-25 where a T stretchiness and on the other a T stumble was encountered. A T stumble was also noted in the last WOT accel, from 0 to 25 in 2nd to 3rd gear. Otherwise, Engine 4-0 performed satisfactorily, had acceptable idle speed and quality, and had little or no audible noise during decels or other operations.

Engine 4-1 likewise did well on the second round of the cold driveaway road course. T stretchy-lean operation was noted during two PT accels from 0-25 mph and during a WOT from 0-40 mph. Exhaust noise continued to be quite noticeable until engine speed would drop below 1650 rpm, just below the throttle open set point for optimization of the decel throttle modulator. A T rough idle was noted at the conclusion of the test. Generally, the moderately loud backfires gave way to a light popping in the exhaust and the lack of a low pressure drop exhaust silencer was considered much of the reason for the exhaust noise.

In summary of the cold driveaway tests, both engines were essentially equivalent. A shade more stretchy-lean operation was reported for the controlled engine. Perhaps the 10 percent pintle on the automatic EGR valve was the reason for slightly more T stretchy-lean rating . Although neither pintle passes a substantial flow of exhaust, this was the only change that has been found in the past that makes the gasoline truck engine perform in an understandable and similar way to some EGR equipped cars. Otherwise, it is concluded that no particularly great effect of engine configuration on the driveability during a cold start - driveaway was observed.

b. Warm Driveability

Once the vehicle was thoroughly warmed up, a series of level road load manifold vacuum readings were taken both ways over a level course. The results are shown as follows for the vehicle powered by Engines 4-0 and 4-1.

Speed mph	Engine rpm	Trans Gear	Rear Axle	Manifold Vacuum, In Hg 4-0	Manifold Vacuum, In Hg 4-1
20	2100	3	Hi	16.75	16.5
30	1925	4	Hi	13.9	14.1
40	2550	4	Hi	12.2	10.5
50	2550	5	Hi	8.5	6.9
55	3100	5	Hi	3.6	3.3

The trend was, at 40 and 50 mph, for the road load vacuum to be lower with Engine 4-1, a fairly common result with automatic EGR tailored for the nine-mode FTP. The use of the air pump also had an effect but the catalysts were not different from the standard muffler in as far as engine exhaust backpressure was concerned. The driveability under cruise conditions was rated satisfactory for both engines.

The WOT accels from 25 to 40 mph in 4th with rapid or slow opening of the throttle resulted in mostly satisfactory operation with T stumble during the rapid open, Engine 4-0, and T hesitation slow open for Engine 4-1. The steps most critical of EGR driveability involve a series of light (13 inch Hg), moderate (9 inch Hg) and heavy (5 inch Hg) PT accels in 4th from 25 to 35 mph. If EGR has a noticeable effect on driveability, this will show it.

Engine 4-0 had T stretchy-lean operation in the moderate (9 inch) and heavy (5 inch) PT accels while Engine 4-1 had T stretchy-lean in all three PT accels with T hesitation in the heavy PT (6 inch) accel. It should be noted that T means trace, a malfunctioning that is just discernible to a test driver. Recall that Engine 4-0 had some EGR (5 percent pintle) and Engine 4-1 had more EGR (10 percent pintle). It is not surprising that both engines exhibited some lean stretchiness so indicative of that with many EGR equipped passenger cars.

A PT light, moderate, and heavy "crowd" type acceleration yielded mostly satisfactory operation for Engine 4-0, a T stretchy rating at the moderate crowd. Engine 4-1 was T stretchy in all crowd type accels with a trace hesitation in the heavy crowd. In all, both engines seemed to be experiencing some lean type operation, Engine 4-1 slightly more than Engine 4-0.

The decels from 35 and 40 mph at PT and CT were generally in agreement with the last half of the cold driveability findings. Engine 4-0 decelerated at CT and PT with little or no exhaust noise and was satisfactory. Engine 4-1 had higher exhaust noise because of the absence of a muffler. Only the twin exhaust oxidation catalysts were used to match the exhaust backpressures in the engine. The power and performance of this engine was reported to be somewhat backpressure sensitive by the Bureau of Mines during initial set-up of a similar engine for durability testing$^{(40)}$.

Engine 4-1 normally responded with light exhaust popping noise during the CT decels while deceleration at PT produced no backfires or popping sound. Backfires during CT decel at engine speeds above 1900 rpm were seldom heard. The thoroughly warmed up engine likely was the reason as this trend of less exhaust noise during CT decel was observed as the engine warmed up while driving the cold driveability course. In general, the air injection in the exhaust manifold has a significant effect on CT decel exhaust backfiring, popping and noise. A properly packaged exhaust catalyst, for suitable sound suppression, would eliminate the excessive noise, making this area of the evaluation rather academic.

Idle quality was rated after a series of WOT accels to above 50 mph and found to be satisfactory with idle rpm of 700. The engine was then shut off, allowed to soak for 15 minutes, started and idled for 30 seconds and then shut off. Idle quality remained satisfactory with no vapor lock, stalling, surging or other roughness or restart difficulties. The engine proceeded to die each time the ignition was turned "off" with no after-run or "dieseling".

In summary, both engines operated satisfactorily in the vehicle and both engines demonstrated a slight tendency to be stretchy under PT accel conditions where EGR was operative. The "control" configuration, Engine 4-1, features more EGR than the "uncontrolled" Engine 4-0, and exhibited slightly more lean, stretchy PT operation. It was generally noted during PT accels and crowds and not during steady state cruise on level road. The trace levels and the incremental increase in lean operation does not, in our judgement, preclude the use of the automatic EGR system, with 10 percent pintle, on driveability grounds. Both engines ran well and the vehicle response with both was quite acceptable.

c. Vehicle Performance

The final portion of each driveability series was a series of accelerations from 0-20, 0-40, 0-60, and 20-50 mph on level road at WOT. Essentially equivalent road performance was obtained with or without the controlled engine. The times and distances required to reach 20, 40, and 60 mph from rest and the 20 to 50 mph accel were quite comparable. Average performance is listed below.

			Accelerations, mph			
Engine	Configuration		0-20	0-40	0-60	20-50
4-0	"Uncontrolled", EGR (5% Pintle), Decel Mod	Time, sec Dist, miles	7.7 0.025	26.7 0.192	62.6 0.651	35.4 0.391
4-1	"Controlled", EGR (10% Pintle), Decel Mod O-Cat, Air	Time, sec Dist, miles	7.9 0.026	26.8 0.189	62.1 0.678	35.8 0.389

The above fails to demonstrate one engine having consistently or significantly better acceleration characteristics than the other. Occasionally some stumble, usually in 2nd gear and T to M in level, was noted with both vehicles but generally the WOT accels were satisfactory and acceptable. No hesitation, lean-stretchy, or surge was noted nor at any time was any fuel deficiency apparent through engine detonation, knock, ping, or rattle.

If this or any other similar faults were with either engine, they would have been found during the gradeability test. The average times, distances, and speeds attained are listed on the following page.

Both engines performed over the grade test equally well and no specific advantage can be given either. The replicate WOT accels repeated nicely and only a T stumble in 2nd (Engine 4-1) marred an otherwise acceptable acceleration performance.

Engine	Configuration	Distance Miles	Max Speed mph	Ending Speed mph	Time Required Seconds
4-0	"Uncontrolled" EGR (5% Pintle) Decel Mod	1.072	54	42	94.0
4-1	"Controlled", EGR (10% Pintle) Decel Mod, O-Cat, Air	1.073	54	42	93.6

The major conclusion of these performance tests was that the vehicle tended to have essentially equivalent acceleration times. The truck tended to stumble some, T on a few occasions and this is probably a function of the vigorous WOT accel. Otherwise, little in the way of driveability difficulties or differences were found during the field performance trials. The slight increase in EGR rate had no effect on the WOT results since EGR is automatic and programmed out at WOT and near WOT. The catalyst backpressure was essentially equivalent to the stock muffler. It is uncertain whether the air pump, the remaining known variable that would affect acceleration, caused enough power loss in Engine 4-1 to show it by the observed data.

d. Catalyst Temperatures

The fourth portion of the road test procedure involved operating the catalytic converter equipped truck for 5 minutes at 60, 50, and 40 mph in 5th High while recording the catalyst bed temperatures. These temperatures, recorded at 10 second intervals, are summarized on Table 29 and the max, min, and arithmetic average value indicated at the bottom. Occasionally the before temperatures were checked and found to be only somewhat different from the bed temperature. The maximum and average of the before catalyst temperatures are at the bottom of Table 29. Normally the difference was 80 to 150 degrees F and averaged about 130 degrees F. The average road outlet temperatures shown in Table 29, were quite similar to that found in the stationary dynamometer operation. At no time during any of the road operation did the catalyst bed temperatures exceed 1540 degrees F. The maximum continuous catalyst temperature recommended by the manufacturer was 1600 degrees F. Both catalyst temperatures were monitored during the cold and warm driveability as well as during the acceleration performance trials and this temperature was never exceeded.

2. Chassis Dynamometer

The results of the 1970-1973 nine-mode FTP and 1975 LD FTP are described in this subsection.

TABLE 29. CHASSIS OPERATED ENGINE 4-1 CATALYST BED TEMPERATURES (5TH GEAR - HIGH RANGE)

	60 mph Cruise		50 mph Cruise		40 mph Cruise	
Min: Sec	Left	Right	Left	Right	Left	Right
			Catalyst Bed			
0:0	1450	1450	1340	1380	1260	1260
0:10	1480	1440	1360	1370	1220	1220
0:20	1480	1460	1360	1370	1200	1200
0:30	1490	1450	1360	1380	1180	1190
0:40	1490	1450	1360	1390	1160	1180
0:50	1500	1460	1350	1380	1160	1190
1:00	1500	1460	1350	1390	1160	1190
1:10	1520	1480	1360	1400	1160	1170
1:20	1520	1470	1380	1410	1150	1160
1:30	1520	1480	1400	1420	1140	1150
1:40	1530	1470	1400	1430	1130	1140
1:50	1530	1480	1400	1430	1120	1130
2:00	1530	1480	1340	1360	1120	1120
2:10	1540	1480	1320	1360	1100	1120
2:20	1530	1480	1340	1380	1100	1120
2:30	1530	1480	1360	1380	1100	1120
2:40	1530	1470	1380	1400	1100	1120
2:50	1540	1470	1400	1410	1070	1090
3:00	1540	1460	1400	1420	1070	1090
3:10	1540	1480	1410	1430	1060	1090
3:20	1520	1500	1410	1430	1050	1100
3:30	1480	1500	1410	1430	1060	1100
3:40	1480	1480	1400	1420	1040	1060
3:50	1500	1470	1360	1370	1050	1070
4:00	1510	1460	1340	1360	1050	1080
4:10	1510	1460	1340	1360	1040	1080
4:20	1520	1470	1350	1380	1040	1080
4:30	1520	1460	1340	1360	1050	1090
4:40	1520	1460	1310	1330	1040	1080
4:50	1520	1440	1300	1320	1060	1100
5:00	1510	1460	1300	1320	1070	1090
Avg	1512	1468	1362	1386	1107	1128
Max	1540	1500	1410	1430	1260	1260
Min	1450	1440	1300	1320	1040	1060
			Before Catalyst			
Avg	1380	1387	1223	1248	958	973
Max	1400	1400	1280	1320	960	980
Min	1360	1370	1150	1160	950	960

a. Nine-Mode FTP

The plan of test was to perform replicate nine-mode FTP tests per the 1970-1973 test procedure immediately after engine installation of Engine 4-0 for comparison with the final stationary baseline tests on the same engine. The average results are summarized in Table 30 and show quite satisfactory correlation of the stationary to chassis engine operated emissions.

TABLE 30. ENGINE 4-0 STATIONARY AND CHASSIS NINE-MODE FTP

Dynamometer	Test	Run	NDIR Instrument Results HC, ppm Hex	 CO, %	 NO, ppm Corr
Stationary	42	1	132	1.07	920
(6-27-73)		2	133	1.06	855
		3	137	1.10	882
	Average		134	1.08	886
Chassis	1	2	179	0.90	816
(7-16-73)		3	170	0.99	862
	Average		175	0.95	839

The above validates the removal and subsequent installation of Engine 4-0 in the vehicle without seriously modifying the emissions behavior of the standard 1973 engine.

b. 1975 Light Duty FTP

The inertia weight was 16,000-lb and the level road load at 50 mph was 55 hp at rear wheels for engine 4-0 and 52 hp for engine 4-1. All tests were made in high rear axle range, starting in second and upshifting to third at 15 mph, as specified, to fourth at 25 and fifth at 40 mph as recommended by the driving schedule. Other shift patterns were investigated and this seemed as good or better than others and made the truck operate more as it might on the road. Table 31 is a listing of the results by engine configuration.

The emission rates were based on 7.5 miles of driving, the specified length. The fuel consumption values are all based on actual net fuel used and measured (5th wheel) miles traveled for the two distinct driving segments, the first 23 minutes or complete LA-4 and then the first 505 seconds of the LA-4 which is done after the prescribed 10 minute soak. The measured distance for the 23-minute test was less than 7.5 miles with an average distance of 7.423 miles. One reason for the slightly lower mileage was inability of the truck to accelerate quite as rapidly to 56 mph as indicated by the LA-4 test. The 7.423 average length may be quite reasonable relative to some fairly heavy automobiles

TABLE 31. 1975 FTP TRANSIENT EMISSIONS - ENGINE 4

Engine Code	Test Configuration	Test No.	Grams per Mile HC	CO	NO_x	Fuel Econ. mpg 23 min	505 sec
4-0	"Uncontrolled",	3	13.17	260.8	4.46	4.83	5.29
	EGR (5% pintle),	4	13.54	273.8	4.56	4.65	5.16
	Decel Mod	Avg.	13.36	267.3	4.51	4.74	5.23
4-1	"Controlled",	1	3.24	84.7	3.72	4.77	4.86
	EGR (10% pintle),	2	3.46	90.5	3.76	4.83	5.19
	Decel Mod, O-Cat, Air	Avg.	3.35	87.6	3.74	4.80	5.03
Percent Reductions, $\frac{\text{4-0 Minus 4-1}}{\text{4-0}} \times 100$			75	67	17	(1.3)	3.8

with small engines. The average distance for the first 505 seconds was 3.494 miles. It is uncertain to the writer how long this should be but these distances compare favorably with earlier tests with Engine 2 in a similar GVW and power to weight ratio HD delivery truck.

In all, the test repeatability and results are quite satisfactory and indicate that the NO_x control system was effective on the transient driving schedule as already demonstrated by the various stationary dynamometer engine exercise procedures. HC and CO also were reduced nicely by the catalyst during the transient test. Copies of the computer reduced data for the four 1975 FTP tests made with this engine are included as Tables D-31 to D-34 of Appendix D. Please refer to these print-outs for more details on this test series.

D. Summary

In summary of this section, a series of stationary dynamometer tests with Engine 4 were conducted to determine the extent of reduction in tailpipe emissions of HC, CO, and NO_2. Results by the three test procedures are listed on Table 32. The results were promising in that substantial emission reductions of HC and CO were demonstrated at a small loss in fuel economy. These results may be reported in terms of percent reductions and, for the controlled versus the "uncontrolled" versions of Engine 4, these are at the bottom of Table 32. The 1975 LDV FTP resulted in improvement of HC, CO, and NO_x as consistent with the nine-mode FTP, EPA and 23-mode stationary tests as could be expected from previous test work. Although HC and CO reductions during the transient test approach were not as good as found by the stationary engine exercise methods, a greater reduction in NO_x was registered during the transient driving procedure.

A series of chassis tests to determine cold start driveaway, warm driveability, and acceleration performance were made with the engine in baseline and control equipped configurations. The major finding was some stretchy-lean type operation during PT and crowd type accelerations for both engines, slightly more with the higher rate of EGR with Engine 4-1 relative to the light EGR schedule used with Engine 4-0.

The throttle modulator system, used to minimize HC during CT decel, worked well to reduce HC according to the FTP but tended to prolong run-down times when operated on the road. The braking effect of the vehicle engine may be impaired somewhat and this affects the way one drives the truck. The overall driveability and road performance seemed little affected by the control equipped engine relative to the baseline engine.

TABLE 32. SUMMARY OF ENGINE 4 RESULTS

Stationary Results

Engine		HC		CO	NO2		Cycle BSFC,
No.	Description	NDIR	FID	NCIR	NDIR	CL	Lb/Bhp-Hr
		Nine-Mode FTP					
4-0	1973 Calif.	4.3	5.6	56.3	6.4	5.7	0.79
4-1	EGR, Air, O-Cat	1.0	0.7	6.2	5.6	5.2	0.85
		Nine-Mode EPA					
4-0	1973 Calif.	3.6	5.3	56.1	6.1	5.7	0.73
4-1	EGR, Air, O-Cat	1.1	0.5	3.6	6.2	5.9	0.72
		23-Mode Exp.					
4-0	1973 Calif.	-	11.6	95.9	-	4.8	0.70
4-1	EGR, Air, O-Cat	-	0.9	15.1	-	4.5	0.75

Chassis Results

Nine-Mode Chassis

Engine No.	Description		HC ppm Hex	CO %	NO (Corr) ppm
4-0	1973 Calif.	Stationary	134	1.08	886
		Chassis	175	0.95	839

1975 LD FTP (LA-4 Mod)

Engine		Grams/Mile			Fuel Econ., mpg	
No.	Description	HC	CO	NO_x	23 min	505 sec
4-0	1973 Calif.	13.4	267.3	4.5	4.7	5.2
4-1	EGR, Air, O-Cat	3.4	87.6	3.7	4.8	5.0

Summary

Test	Percent Reductions			
Procedure	HC (FID)	CO	NO_2 (CL)	Fuel Cons.
9-Mode FTP	88	89	9	(8)
9-Mode EPA	91	94	(4)	1
23-Mode Exp.	92	84	6	(7)
1975 LD FTP	75	67	18	0

( ) means increase.

VII. ENGINE 5 RESULTS (318 CID GASOLINE)

Evaluations with Engine 5 were initially intended to be a continuation of the previous project conducted at the Bureau of Mines(16). However, the engine used at the Bureau of Mines was no longer available, and the manually operated EGR system used at the Bureau was not applicable for the vehicle driveability evaluations. Since the engine manufacturer could supply a medium duty version of the engine, complete with prototype EGR and air injection systems, the decision was made to use this engine. The engine had been used by the manufacturer for emissions research.

The only difference between the 1972 (Engine 5-0) and 1973 (Engine 5-00) standard engine configurations was ignition timing retard of 2.5° for 1973. The effect of such a slight change as this was fairly well documented in this and the previous project. The controlled configuration, Engine 5-1, utilized a different carburetor in addition to EGR, air injection, and oxidation catalysts (monolith). Several problems were initially encountered with this engine and this necessitated changing the order of testing in that the control configuration was run before the standard baseline. This order of testing, in itself, has no direct effect on the results.

The EGR system provided for this engine used amplified carburetor-venturi vacuum for control of the EGR valve. Since the venturi vacuum in the carburetor increases as the engine intake air flow increases, the amplified vacuum signal to the EGR valve also increases. This enabled direct use of the EGR signal vacuum with a simple globe-type seat to control the EGR flow rate into the engine. All of the other EGR systems used in the gasoline engine phase of this project utilized contoured pintles to control the flow rate of EGR. The computer printouts and a summary for the emission tests with Engine 5 are in Appendix E.

A. Engine Preparation

The engine as received did not run properly in the baseline configuration and the problem was traced to the carburetor. However, an initial examination of this carburetor failed to reveal the specific cause of the problem. With the replacement carburetor, supplied for use in the controlled configuration, the engine operated properly but gasoline would continue to flow into the engine for a period after the engine was shut down. This problem, however, was readily solved by disassembly and cleaning of this replacement carburetor. Therefore, a decision was reached to initially run the engine in the controlled configuration and run the baseline configuration after a satisfactory carburetor could be obtained. Power output, fuel flow and EGR operation were determined in the controlled configuration of the engine and the results were found to agree with results reported by the manufacturer.

The problem with the baseline carburetor was subsequently found to be caused by a gasket which was installed incorrectly. A new gasket was installed and this carburetor was used in the standard baseline configuration of the engine.

B. Stationary Operated Results

Since the standard baseline runs could not be obtained at the start of the evaluations, due to the difficulty with the baseline carburetor, some initial determinations were made with the controlled carburetor to establish a relative baseline. This configuration was designated Engine 5-0X and the subsequent 1972 standard configuration was designated as Engine 5-0. The best combination which consisted of EGR, air injection and oxidation catalysts was designated 5-1.

The 1973 standard configuration, which differed from the 1972 configuration only by a 2.5° retard of the ignition timing, was designated Engine 5-00. Reportable runs with Engine 5-00 on the stationary dynamometer were obtained only with the nine-mode FTP. The effect of a 2.5° change in ignition timing, however, does not normally produce a very significant change in emissions and BSFC in a single determination. This is illustrated in the parametric results with Engines 6 and 7, where the effects of a 2.5° change in ignition timing were considerably less than the variation in repeat determinations of the baseline configuration.

1. FTP Nine-Mode Results

A summary of the nine-mode FTP results with Engine 5 is presented in Table 33. The 1973 baseline engine exhibited approximately 20 percent lower composite NO_2 and 3 percent higher BSFC than the 1972 baseline configuration. With the "best combination" configuration (Engine 5-1) relative to the 1973 baseline, the FID-HC was reduced 97 percent and the CO was reduced 98 percent. The composite NO_2 was reduced approximately 50 percent and the BSFC was increased 11 percent.

This engine in the baseline configuration was a relatively high CO producer. In all nine-mode FTP tests, the overriding majority of CO was produced at the 3 in. Hg manifold vacuum condition. (With the subsequent nine-mode EPA and 23-mode EPA tests, the high load operating conditions were also the overriding contributors of CO. Although the CO emissions from this baseline engine are probably not representative of the emissions obtained with a certification engine, this engine is important from the standpoint of determining the effects of the emission controls on a relatively high CO emitting engine.

TABLE 33. NINE-MODE FTP EMISSIONS SUMMARY FOR ENGINE 5

		Average Composite Emissions					Cycle
Engine		HC		CO	NO_2		BSFC,
No.	Configuration	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp Hr
5-0	1972 Baseline	6.7	10.4	106	10.0	8.8	0.73
5-00	1973 Baseline*	6.4	10.1	114	8.3	6.9	0.73
5-0X	Control Carburetor	6.3	8.3	62	8.6	8.1	0.67
5-1	EGR+AIR+CAT	0.8	0.3	2.1	4.0	3.9	0.81
Percent Reduction 5-0 to 5-00		4	3	(8)	17	22	(3)
Percent Reduction 5-00 to 5-1		88	97	98	52	43	(11)
Percent Reduction 5-0 to 5-1		88	97	98	60	56	(14)

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*Differs from 1972 Baseline only by a 2.5° retard of ignition timing.
( ) means increase.

2. EPA Nine-Mode Results

The controlled configuration of Engine 5 could not be evaluated using the standard nine-mode EPA procedure. With the EGR system used on this engine, the 90 percent torque mode of the procedure could not be obtained without bleeding down the vacuum stored in a vacuum reservoir. The vacuum reservoir bleeds down at WOT but the time required was too long to enable using WOT bleed-down when operating the nine-mode EPA procedure. Therefore, to enable running the nine-mode EPA, a solenoid valve was used to bleed-down the vacuum reservoir when going to the 90 percent mode. The results, as run, are given in Table 34. The most significant difference between the nine-mode EPA and the nine-mode FTP results was in the composite BSFC. The BSFC for the controlled configuration, relative to the 1972 baseline, was essentially unchanged in the nine-mode EPA as contrasted to an increase of greater than 10 percent in the nine-mode FTP. Another difference was obtained with composite NO_2, where the reduction with the controlled configuration was approximately 40 percent in the nine-mode EPA compared with over 55 percent in the nine-mode FTP.

TABLE 34. NINE-MODE EPA EMISSIONS SUMMARY FOR ENGINE 5

Engine		Average Composite Emissions					Cycle
		HC		CO	NO_2		BSFC,
No.	Configuration	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp Hr
5-0	1973 Baseline	6.6	9.4	119	7.7	7.5	0.71
5-00	1973 Baseline**	6.6	9.4	119	6.9	6.7	0.71
5-1	EGR*+AIR+CAT	0.6	0.3	5.6	4.6	4.4	0.72
Percent Reduction 5-0 to 5-1		91	97	95	40	41	(1)

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*Required the use of a solenoid operated dump valve.

**Data adjusted for a 2.5° deviation in ignition timing

3. EPA 23-Mode Results

The EPA 23-mode results are summarized in Table 35. Composite reduction of HC-FID, in the controlled configuration (5-1) relative to the baseline (5-0), was essentially the same as the reductions obtained with both nine-mode procedures. The reduction in NO_2 and the increase in BSFC is essentially equal to the average of the results obtained in the two nine-mode procedures. The reduction in CO with the controlled configuration, however, was drastically different from the CO reductions obtained in the nine-mode procedures. Essentially all of the CO in the controlled configuration 23-mode test occurred in the high load conditions where there was an apparent shortage of injected air to enable complete conversion of the CO to CO_2. This has occurred with several of the engines in this evaluation, where the air pump is sized for the 2000 rpm -

TABLE 35. EPA 23-MODE EMISSIONS SUMMARY FOR ENGINE 5

Engine		Average Composite Emissions					Cycle
		HC		CO	NO_2		BSFC,
No.	Configuration	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp Hr
5-0	1972 Baseline	-	7.6	78	-	9.7	0.67
5-00	1973 Baseline*	-	7.6	78	-	8.7	0.67
5-1	EGR+AIR+CAT	-	0.3	33	-	4.9	0.72
Percent Reduction 5-0 to 5-1			96	58	-	49	(7)

*Data adjusted for a 2.5° deviation in ignition timing

3 inch Hg condition of the nine-mode FTP but is not sufficient for the full load conditions of the 23-mode test. In some respects, this serves as a safety feature for the catalyst in that maximum catalyst temperature is controlled to a large extent by the available air.

C. Chassis Operated Results

The chassis studies were performed with Engine 5 installed in a 1970 Dodge 400 2 axle flat bed truck License Tex GJ 8685. The truck had a 4 speed forward transmission and single speed rear axle and used 7.50-20 tires. The nameplate gross vehicle weight was 16,500 lbs and empty weight was 5,650 lbs. The test weight was 11,175 lbs and was achieved by loading 11 drums of water and some sand bags on the truck.

A head board of eight ft wide by six ft high was attached to the wooden bed that was eight ft wide by 12 ft long. The odometer reading was 60,632 at the beginning and 61,039 miles at end of the field and chassis testing.

1. Road

In general the power to weight ratio for this truck was quite adequate to make the vehicle respond. The 16,500 GVW truck is a fairly popular HD gasoline powered vehicle in delivery and service applications. Thus the desire to include one of the vehicles in this group near the 16,000 GVW minimum defined for this program. The tests were made in both baseline or uncontrolled configuration, Engine 5-00, consisting of no external control items and 2.5 degree BTC timing at 750 rpm. The controlled engine, Engine 5-1, featured 5 degree BTC timing, air injection pump, automatic EGR system with vacuum amplifier, prototype 1975 carburetor and a pair of oxidation catalysts. Weather conditions were quite stable throughout the test period with little or no wind and no inclement weather. Wet/dry bulb temperatures and barometric pressures were quite stable. All driving followed usual driver habit.

a. Cold Start Driveaway

All tests were made with a minimum indoor overnight soak of 16 hours at 75°F. Then the vehicle was rolled outside to the starting point. The test of Engine 5-00 was performed in duplicate while Engine 5-1 was performed once.

The time required for the engine to start was 5 seconds for both engines. Each carburetor was equipped with automatic choke that was connected and apparently functioning properly. Fast idle speed directly after engine start was 1075 for Engine 5-00 and 1000 for Engine 5-1 with a T to M rough idle during the first 28 seconds of idle

(Engine 5-00) and M rough idle for Engine 5-1. The engine then increased in speed by about 150 rpm after the engine clearing operation but idle quality generally improved during this next 20 seconds. A T roughness was noted for Engines 5-1 and 5-00 during the last 5 seconds. Both engines continued to idle at about 1300 rpm with satisfactory idle quality.

The first accel, a PT in 2nd to 4th from 0 to 25 mph was found to give a T hesitation and T stumble for Engine 5-00 and a T hesitation and T stretchy-lean for Engine 5-1. These are good marks for a "cold" engine after less than 1 minute idle. The next operation, a WOT accel in 4th from 25 to 35 mph uphill with Engine 5-00 produced a T stumble and a T to M hesitation while Engine 5-1 was T hesitation and T lean. The subsequent uphill CT decel in 4th to stop was satisfactory for Engine 5-00 and accompanied by a number, about 10 to 15, of sharp, moderately loud exhaust backfires with Engine 5-1. This engine includes twin exhausts, each fitted with an oxidation catalyst and no exhaust muffler or silencer.

The engine idle quality and rpm for both engines was satisfactory and had reduced to about 700 to 750 rpm at the first stop sign indicating the automatic choke was operating. Another PT accel to 25 mph was made with a T stumble with Engine 5-00 and a T to M stretchiness with Engine 5-1 noted. As mentioned earlier with Engine 4, the stretchiness is associated with lean operation and is generally attributed to the automatic EGR system although this is not necessarily the only cause of it. The long, downhill, CT decel in 4th, at average of 1500 rpm, resulted in satisfactory operation with both engines. At the stop sign at the bottom of the hill, the engine idled satisfactory and at about 650 rpm, Engine 5-00, and 750 rpm for Engine 5-1.

The next operation was a WOT accel to 40 mph through the gears from 2nd to 4th. One test of Engine 5-00 gave an M stumble and the other resulted in a T hesitation while a T stumble was noted for Engine 5-1. The CT decel downhill, average speed 2000 rpm, was satisfactory for Engine 5-00 with as many as 20 light pops in the exhaust of Engine 5-1. The idle continued satisfactory at the mandatory stop that followed.

Another PT accel to 25 mph, 2nd to 4th, was then made and Engine 5-00 one time had a satisfactory accel and the other a T hesitation whereas Engine 5-1 had a T to M stretchy operation. The WOT accel to 40 mph in 4th which followed resulted in a T hesitation for Engine 5-00 and satisfactory operation for Engine 5-1. Although the CT decel back to 25 mph (1500 rpm average) was satisfactory for Engine 5-00, about 5 light pops were noted, basically at the start of the decel, with Engine 5-1. Another WOT accel in 4th back to 40 mph was performed, after a short cruise at 25 mph, and this accel was satisfactory with both engines. The CT decel to rest was identical to the previous decel from 40 mph.

Another PT accel from 0-25 mph, 2nd to 4th gear was then performed followed by a WOT accel in 4th to 40 mph uphill. Operation on both was found to be satisfactory with both engines. The PT decel to stop, was satisfactory for both engines with average of 2000 rpm noted. Either Engine 5-1 was warmed up sufficiently to reduce the exhaust popping or operation at PT is the reason. Next, a WOT accel uphill from 0-25 using 2nd and 3rd was performed with satisfactory operation of Engine 5-00 and for the first time, a T surge rating in 3rd gear with Engine 5-1.

To complete the first circuit, a PT decel to rest was made with satisfactory operation for both engines found. A 30 second idle was then observed with idle rpm of 650 on one test and 700 on the other for Engine 5-00 and a 720 rpm idle speed for Engine 5-1 recorded. Idle quality was satisfactory.

The second time around the cold start-driveaway course resulted in satisfactory operation under all test conditions for Engine 5-00 both tests. Engine 5-1 was not quite as good in its operation with a T and sometimes almost an M stretchiness noted in three of the four PT accels from 0 to 25 mph. Most of the operation was in 3rd gear and this was where the lean operation was most noticeable. All CT decels, especially from 40 mph, resulted in a light popping sound in Engine 5-1 exhaust. Idle speed and quality remained at or near the 750 rpm specification and no roughness was noted.

In all, both engines performed mostly satisfactorily during the cold start-driveaway test procedure. The truck started easily and readily and did not stumble and buck during PT and WOT accels as some in the past. It could be the power to weight or the gearing of the truck had something to do with it. Although this is the smallest truck that will be tested, it was also powered by the smallest engine.

The major difference in the cold start driveability was the stretchy-lean operation noticed with the EGR equipped Engine 5-1. As with other trucks and light duty passenger cars, this seems to be one of the major driveability concerns with EGR. A trace to moderate rating means easily discernible to a test driver or experienced observer and noticeable to the above average driver. It is uncertain whether Engine 5-1 would produce a complaint from an average driver but it is probable that a driver that is particular would be annoyed and likely to complain.

b. Warm Driveability

The vehicle was thoroughly warmed up before beginning this series of tests. A series of level road load manifold vacuum readings were taken both ways over a level course and the results are as follows for the vehicle powered by Engines 5-00 and 5-1.

Speed	Engine	Trans	Intake Manifold Vacuum, in. Hg	
mph	rpm	Gear	Engine 5-00	Engine 5-1
20	2000	3	18.6	18.5
30	1800	4	16.6	16.2
40	2400	4	14.0	12.5
50	2975	4	11.0	9
60	3550	4	6.5	5.5

Note the variation in vacuums for 40, 50, and 60 mph. This is the manifold vacuum range where the automatic EGR valve was functioning thereby causing a lower vacuum for the same basic road load. Of course, a different carburetor and the air pump will affect the engine power setting but this indicator of road load seems to follow the pattern set by other HD engines in this project when equipped with automatic EGR. The driveability during the level road cruise operation was termed satisfactory for Engine 5-00 and a trace stretchy for Engine 5-1 at 40 and 50 mph.

The warm driveability involves a number of PT and WOT accels and PT and CT decels using the special driveability procedure developed for this project. In only one instance, the initial WOT rapid open accel from 25 to 40 mph in 4th did Engine 5-00 result in a less than satisfactory rating and then only a T hesitation was noted. All other accels and decels were termed satisfactory for Engine 5-00.

Engine 5-1 experienced mostly satisfactory operation under most all conditions including the WOT accel, with rapid and slow initial throttle opening from 25 to 40 mph in 4th gear. Engine 5-1 experienced a T stretchiness during the light (14 inch) and T to M lean operation during the moderate (10 inch) and heavy (6 inch) PT accels from 25 to 35 mph in 4th. Engine 5-1 experienced a T stretchiness during the light and moderate PT crowd accels.

In one instance the heavy PT (6 inch) accel from 25 to 35 mph, a slight trace of surge was noted and was similar to, but fainter, than the surge found during a WOT accel to 25 mph in 3rd gear during the cold driveability testing. Decelerations at CT (24 inches vacuum) from 35 or 40 mph always resulted in the light exhaust popping noise whereas Engine 5-1 did not produce excessive exhaust noise or backfiring when decelerated at PT of say 19 inches vacuum. The exhaust noise with Engine 5-1 seems less and more tolerable during the warm driveability runs.

Neither engine encountered any difficulty in starting or stopping after repeated WOT accels to 60 mph. The idle speed was a nominal 700 rpm after the high speed runs with no after-run or dieseling noted with key "off". After a 15 minute soak, Engines 5-00 and 5-1 easily restarted with engine rpm a nominal 600 rpm. Idle quality was found to be satisfactory except for the restart of Engine 5-1 which had a T rough idle.

In summary of the warm driveability test series, Engine 5-1 performed almost but not as well as Engine 5-00. Several T to M stretchy-lean ratings were given Engine 5-1 during the constant PT and light and moderate crowd type PT accelerations. The T lean operation findings at PT confirm the observations made in the course of the cold driveability as did the light popping sound of Engine 5-1's exhaust. The latter observation could be remedied by packaging the oxidation catalyst in a suitable muffler-exhaust silencer. The action of the automatic EGR, among other factors of different carburetor and addition of air injection pump, results in having to operate the engine at increased throttle openings for the same road load and speed. This is typical of automatic EGR systems tailored for the nine-mode FTP.

c. Vehicle Performance

This portion of the road testing was a series of accelerations from 0-20, 0-40, 0-60, 20-50 mph on level road in two directions at WOT. The average times and distances required to reach 20, 40, and 60 mph from rest and the 20 to 50 mph accel were quite comparable and are shown below.

Engine Code	Test Configuration		Accelerations, mph			
			0-20	0-40	0-60	20-50
5-00	Uncontrolled, 2.5 Degree BTC Timing 750 rpm Idle	Time, sec	5.9	16.5	43.5	22.1
		Dist, miles	0.019	0.112	0.496	0.238
5-1	Controlled, 5 Degree BTC Timing, O-Cat, Air, 1975 Proto. Carb	Time, sec	5.7	16.6	44.4	22.3
		Dist, miles	0.019	0.115	0.510	0.240

Engine 5-00, during the 0-60 mph WOT accel (the most difficult of the four to repeat), appeared to be about 1 second faster out of 44 seconds. This was the only condition to result in some difference worth mentioning. Practically all accels with Engine 5-00 were termed satisfactory from a driveability standpoint. Occasionally a T stumble in 2nd gear during the 0-20 and 0-40 mph accels was noted. Much the same driveability ratings were given Engine 5-1 during these WOT accels with T stumble in 2nd (0-20 mph and 0-40 mph) with a T hesitation in one of the 0-40 mph WOT accels.

The grade performance during the maximum power, WOT accel from rest over the 1.075 mile course, was also found to be mostly similar. The following are average times, distances, and speeds attained.

Engine Code	Test Configuration	Distance Miles	Max Speed mph	Ending Speed mph	Time Required Seconds
5-00	Uncontrolled, 2.5 Degree BTC Timing 750 rpm Idle	1.074	59	49	82.6
5-1	Controlled, 5 Degree BTC Timing, O-Cat, Air, 1975 Proto.Carb.	1.077	61	52	79.7

Except for a T surge noted during 3rd gear on the first run with Engine 5-1, the acceleration and grade performance with both engines was repeatably satisfactory. The above measurements tend to show Engine 5-1 a slightly more powerful, better performing truck. It definitely accelerated to a higher speed during the 0.75 mile flat and held that speed better during the last 0.25 miles of steep uphill operation.

The major conclusion of these field performance tests was that the vehicle tended to have essentially equivalent overall performance regardless of the engine. A slightly faster 0-60 mph accel was noted for Engine 5-00 while a noticeably better grade performance was demonstrated by Engine 5-1. The prototype 1975 carburetor may have been the key to the slightly better Engine 5-1 grade performance although this same effect should have been noted during the 0-60 mph accels. The latter have been more difficult to run satisfactorily and the repeatability over the grade performance test course is exceptional.

Other factors that may have entered in were the advanced timing and the use of the air injection pump. These two may have cancelled each other with regard to power and performance. The exhaust catalyst backpressure on the engine was essentially the same as that using a stock muffler.

d. Catalyst Temperatures

Catalyst temperatures are listed on Table 36 and the maximum, minimum and average value indicated. Occasionally the before temperatures were checked and found to be only slightly different from the outlet temperature. The maximum, minimum, and average inlet temperatures are shown at the bottom of Table 36. Normally the difference was 2 to 40 degrees F and averaged about 20 degrees F between the inlet and outlet of the reactors. The average road outlet temperatures were similar to that found in the stationary dynamometer operation. On several occasions, the outlet temperature exceeded 1600°F during the 60 mph operation. This was at fairly high engine speed, 3550 rpm, and near maximum power, 5 inches intake manifold vacuum.

2. Chassis Dynamometer

The nine-mode chassis to stationary test data and the results of the replicate tests according to the 1975 FTP are described in this section.

a. Nine-Mode FTP

Composite emissions of the baseline engine on the stationary dynamometer and in a truck operating on a chassis dynamometer are shown in Table 37. In the vehicle, the engine could be idled satisfactorily at a CO level near 1 percent; but during the nine-mode test on the chassis dynamometer, the CO level generally ranged from 1.5 to 2.0 percent. The CO level at idle was determined to have a relatively minor effect on the composite emissions. The good agreement of the stationary and chassis data in the table indicate that no significant changes in engine operation resulted from the installation of the engine into the truck.

TABLE 37. ENGINE 5-00 STATIONARY AND CHASSIS NINE-MODE FTP

			NDIR Instrument Results		
Dynamometer	Test	Run	HC, ppm Hex	CO, %	NO, ppm (Corr)
Stationary	38	1	211	2.9	1244
		2	215	2.6	1270
		3	205	2.5	1247
		Avg.	210	2.7	1253
Chassis	1	1	221	2.7	1203
		2	225	3.1	1097
		Avg.	223	2.9	1100

TABLE 36. CHASSIS OPERATED ENGINE 5-1 CATALYST OUTLET TEMPERATURES (4th GEAR)

	60 mph Cruise		50 mph Cruise		40 mph Cruise	
Min:Sec	Left	Right	Left	Right	Left	Right
			After Catalyst			
0:0	1540	1580	1400	1400	1200	1290
0:10	1520	1560	1360	1360	1200	1280
0:20	1520	1600	1320	1360	1180	1240
0:30	1600	1620	1340	1400	1180	1240
0:40	1640	1640	1360	1420	1160	1240
0:50	1620	1640	1340	1440	1160	1240
1:00	1660	1650	1400	1440	1170	1250
1:10	1700	1700	1360	1410	1180	1260
1:20	1700	1700	1320	1390	1200	1260
1:30	1700	1700	1340	1420	1160	1240
1:40	1660	1640	1360	1440	1160	1210
1:50	1680	1660	1450	1460	1140	1220
2:00	1600	1600	1420	1460	1140	1200
2:10	1560	1600	1400	1480	1120	1200
2:20	1540	1600	1420	1460	1120	1200
2:30	1560	1600	1360	1400	1140	1200
2:40	1640	1640	1340	1380	1120	1220
2:50	1600	1600	1320	1360	1180	1300
3:00	1600	1600	1340	1380	1220	1300
3:10	1560	1540	1360	1440	1180	1260
3:20	1600	1580	1400	1480	1160	1240
3:30	1520	1600	1440	1450	1160	1200
3:40	1560	1600	1360	1440	1140	1200
3:50	1540	1600	1410	1460	1140	1200
4:00	1500	1600	1400	1480	1140	1240
4:10	1540	1570	1410	1480	1180	1260
4:20	1540	1600	1420	1460	1200	1240
4:30	1560	1600	1400	1460	1160	1220
4:40	1540	1600	1420	1460	1160	1200
4:50	1520	1550	1400	1440	1150	1220
5:00	1520	1560	1360	1400	1160	1220
Avg	1585	1611	1378	1429	1163	1235
Max	1700	1700	1450	1480	1220	1300
Min	1500	1540	1320	1360	1120	1200
			Before Catalyst			
Avg	1581	1609	1340	1389	1148	1211
Max	1660	1700	1380	1400	1160	1240
Min	1520	1520	1320	1360	1140	1200

b. 1975 Light Duty FTP

The inertia weight was 11,200 lbs (as compared with the test weight of 11,175) and the level road load at 50 mph was 51 hp for Engine 5-00 and 54 hp for Engine 5-1. It could be that this observed difference in hp was due to the air pump used in Engine 5-1 as well as experimental error. These road load power levels were nearly identical to that for Engine 4 even though truck 4 was bigger, had larger frontal area, and carried a larger test weight.

All tests were made starting in 2nd gear as has been normal practice and then upshifting to third at 15 mph and to 4th at 25 mph. These upshift points are those indicated on the strip chart driving aid and were considered better than other shift points. Several other combinations were tried during the familiarization running with this truck. Table 38 is a summary of the results by engine configuration.

TABLE 38. 1975 FTP TRANSIENT EMISSIONS - ENGINE 5

Engine Code	Test Configuration	Test No.	Grams per Mile HC	CO	NO_x	Fuel Econ, mpg 23 min	505 sec
5-00	Uncontrolled, 2.5	3	9.56	136.4	7.37	5.87	6.68
	Degree BTC Timing	4	10.84	139.1	7.52	5.81	6.67
	750 rpm Idle	Avg.	10.2	137.8	7.40	5.84	6.68
5-1	Controlled, 5 Degree	5	3.36	61.53	5.46	5.65	6.30
	BTC Timing, Air	8	3.01	64.06	4.72	5.51	6.23
	Pump, O-Cat, 1975	Avg.	3.19	62.80	5.09	5.58	6.27
	Proto Carb.						

The emission rates were based on the specified 7.5 mile driving distance. The fuel consumption values were based on actual net fuel used and measured (5th wheel) miles traveled for the two distinct driving segments, the first 23 minutes or entire LA-4 and then the first 505 seconds of the LA-4 which is done after the prescribed 10 minute soak. The measured distance was, unlike previous trucks similarly tested, slightly more than 7.5 miles. The average for the first 23 minute run was 7.538 miles and probably reflects the improved ability of this truck to operate over the LA-4 driving schedule. The inertia weight greatly affects the ability of the truck to start and stop which in turn affects the distance traveled. The average distance of the 505 second run, after the 10 minute soak, was 3.561 miles.

In all, a 69 percent reduction in HC, 55 percent reduction in CO and a 31 percent reduction in NO_x was obtained by the 1975 FTP, a transient type driving test. Although the catalyst appeared to have less effect on HC and CO during the initial cold start 505 seconds of operation, the HC and CO were much less during the subsequent second and third bags of the test. The reduction in NO_x of 31 percent was not as great as expected. It was noted that during the LA-4, the throttle and intake vacuum was many times in position to call for little or no EGR signal such as CT , WOT, or near WOT and at light PT. The point is that the automatic EGR system was operative and did serve to reduce NO_x some.

Fuel consumption in mpg was found to increase slightly with the control versus the baseline engine during operation on the FTP. This means the controlled engine suffered no apparent fuel penalty, at least by this test method. Please refer to Appendix Tables E-30 to E-33 for the computer print-outs of these results where more detail is given.

D. Summary

A series of stationary dynamometer tests, using the three test procedures of nine-mode FTP and EPA and 23-mode experimental, were completed on Engine 5. These involved running the engine in two basic configurations and in one control configuration. As shown on summary Table 39, substantial reductions in HC, CO, and NO_x were obtained by all three procedures when an oxidation catalyst plus air injection and an automatic EGR system were employed with a modified carburetor.

Comparisons of the percent reduction in emissions by the transient 1975 LDV FTP with that obtained by the three engine exercise procedures revealed some similarities and differences. These are listed at the bottom of Table 39. HC by the LDV FTP was reduced 69 percent versus the consistent 97 percent by the three stationary methods. CO, by the LDV FTP was reduced 54 percent, in line with the 23 mode result of 58 percent reduction but less than the 95-98 percent by the nine-mode FTP & EPA procedures.

Note the fairly good agreement between the LA-4 CO reduction of 54 percent, on a grams per mile basis, and the CO reduction of 58 percent by the 23 mode procedure on a grams per bhp-hr basis. The effect of WOT operation, as a producer of CO, is common to both schedules and is probably the major reason the 23-mode agrees well with the LDV FTP. NO_x was reduced by 31 percent on the transient as compared to the 34 to 44 percent by the stationary procedures. Fuel economy was decreased some by the control during the stationary tests and transient procedures.

The controls, however, had a noticeable effect on driveability

TABLE 39. SUMMARY OF ENGINE 5 RESULTS

Stationary Results

Engine		HC		CO	NO$_2$		Cycle BSFC
No.	Description	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
	9-Mode FTP						
5-00	1973 Standard	6.4	10.1	114.0	8.3	6.9	0.73
5-1	Air, O-Cat, Timing Adv. 2.5°, 1975 Proto. Carb.	0.6	0.3	2.1	4.0	3.9	0.81
	9-Mode EPA						
5-00	1973 Standard*	6.6	9.4	119.0	6.9	6.7	0.71
5-1	Air, O-Cat, Timing Adv. 2.5°, 1975 Proto. Carb.	0.6	0.3	5.6	4.6	4.4	0.72
	23-Mode Exp.						
5-00	1973 Standard*	-	7.6	78.0	-	8.7	0.67
5-1	Air, O-Cat, Timing Adv. 2.5°, 1975 Proto. Carb.	-	0.3	33.0	-	4.9	0.72

Chassis Results

9-Mode Chassis

Engine No.	Description		Grams/Miles HC ppm Hex	CO %	NO (Corr) ppm
5-00	1973 Std.	Stationary	210	2.7	1253
		Chassis	223	2.9	1100

1975 LD FTP (LA-4 Mod)

Engine		Grams/Mile			Fuel Econ., mpg	
No.	Description	HC	CO	NO$_x$	23 min	505 sec
5-00	1973 Standard	10.2	137.8	7.4	5.8	6.7
5-1	Air, O-Cat, Timing Adv. 2.5°, 1975 Proto. Carb.	3.2	62.8	5.1	5.6	6.3

Summary

Test	Percent Reductions			
Procedure	HC(FID)	CO	NO$_2$(CL)	Fuel Cons.
9 Mode FTP	97	98	43	(11)
9 Mode EPA	97	95	34	(1)
23 Mode Exp.	96	58	44	(7)
1975 LD FTP	69	54	31	(4)

( ) means increase

*Data was adjusted for a 2.5° deviation in ignition timing.

under PT operation at light to heavy rates of acceleration. Apparently the automatic EGR system is affecting the engine during PT to give a T to M stretchy-lean operation with some slight hesitation. This condition might result in driver complaint by the more particular driver but would likely be acceptable to some drivers of trucks. In any event, the EGR schedule seems about maximum for this engine configuration. Otherwise, both engines performed well and all other indications were nominal and satisfactory. In conclusion, reductions in all emissions were obtained by the use of an oxidation catalyst, automatic EGR and other engine changes without significant change in driveability or performance.

VIII. PARAMETRIC ENGINE 6 RESULTS (440 CID GASOLINE)

Engine 6 was one of two engines selected for parametric study during the stationary dynamometer test phase. By parametric is meant the measurement of the effect of various enging parameters and individual emission control systems. The approach was much the same as with the two engines similarly studied in the previous project.(6)

A. Engine Configurations

Engine 6 was received in the 1973 Standard configuration with an 8:1 CR and standard ignition system. A lower compression cylinder head (7:1), head gasket set, carburetor, and electronic ignition system were included separately with the engine for its later conversion to the parametric baseline configuration. Also included with these parts was a decel modulator for evaluation as a control item with the parametric baseline engine.

The 1973 Standard engine was designated Engine 6-00 and, upon recommendation of the manufacturer, was subjected to an initial 16-hr dynamometer variable speed and load break-in. The idle speed and timing of the engine was set at 750 rpm and 6° BTDC. Idle CO was set at one percent or lower. A limited power curve obtained with Engine 6-00 indicated its operation was to manufacturer's specifications.

After completion of the FTP nine-mode, EPA nine-mode, and EPA 23-mode runs on Engine 6-00, it was converted to the configuration selected to serve as the parametric baseline. This required changing the cylinder head on the engine to the lower compression ratio (7:1) and replacing the carburetor and ignition system using the aforementioned items. The engine as as modified and set to the same idle rpm and timing as Engine 6-00 was designated 6-0P. A definite loss of idle quality was noted on Engine 6-0P with initial attempts to set the CO to the recommended level of one percent or less. Satisfactory idle quality was found at CO levels of 1.5 to 2.0 percent and thereafter used at this CO range throughout the parametric study. As with Engine 6-00, a limited power curve obtained with Engine 6-0P indicated its operation was in line with the manufacturer's expectations.

B. Stationary Operated Results

As required by the project, the parametric studies were made using the nine-mode tests and consequently, most of the data and its discussion will be on that basis. Baseline tests and "best combination" type tests were made by the EPA 23-mode procedure when appropriate. The organization and presentation of results will follow the test sequence as whether baseline parametric or "best-combination" in nature. The computer printouts for the resultant emissions tests with Engine 6 are shown in Appendix F and include the various summaries of composite emissions.

1. Baseline

A summary of the results of the two baseline engines tested by the three procedures is given in Table 40.

TABLE 40. BASELINE EMISSIONS TEST RESULTS - ENGINE 6

Engine		Test		Average Composite Emissions, Grams/Bhp-Hr					Cycle BSFC
				HC		CO	NO_2		
No.	Configuration	No.	Date	NDIR	FID	NDIR	NDIR	CL	Lbs/Bhp-Hr
				Nine-Mode FTP					
6-00	1973 Standard	51	7-16	4.2	6.7	63.4	10.0	9.5	0.77
6-0P	Parametric Baseline	55	7-25	5.4	6.9	40.8	9.8	9.2	0.93
		58	7-30	5.0	7.2	44.6	11.3	10.7	0.91
		63	8-06	5.1	7.2	41.4	8.5	8.2	0.90
		79	8-24	4.8	6.4	40.0	11.2	10.9	0.90
		Average		5.1	6.9	41.7	10.2	9.8	0.91
				Nine-Mode EPA					
6-00	1973 Standard	52	7-17	3.7	5.8	74.8	9.3	8.9	0.68
6-0P	Parametric Baseline	66	8-09	3.5	4.7	31.9	11.3	10.8	0.74
				23-Mode Exp.					
6-00	1973 Standard	53	7-17	--	4.5	78.4	--	8.0	0.71
6-0P	Parametric Baseline	78	8-22	--	6.3	68.4	--	9.8	0.74

a. Nine-Mode FTP

Except for CO, little difference between emission levels is noted for Engine 6-00 and 6-0P (Test 55). Engine 6-0P produced 36 percent less CO than 6-00. The BSFC of the parametric baseline engine was found to be higher than that of Engine 6-00. This is not too surprising in view of Engine 6-0P being a lower compression engine and equipped with a different carburetor. The FTP nine-mode test can also influence cycle weighted BSFC since the engine is always run using constant manifold vacuums at the power producing modes. For example, the 16 inch brake power observed with Engine 6-0P was substantially lower than Engine 6-00. Tables F-4 through F-8 in Appendix F, are helpful in making a rough comparison of the observed loss in brake power with 6-0P, when compared with 6-00 at the 3, 10, 16 and 19 in. modes. With Engine 6-0P, the hp was approximately reduced by 7 percent at the 3 in. mode, by 20 percent at the 10 in. mode, and by 46 percent at the 16 in. mode. It is also evident with Engine 6-0P that no power was produced at the 19 in. mode.

With regard to the lower composite CO obtained with Engine 6-0P, it appears that the parametric baseline engine was more efficient than Engine 6-00 in converting CO to CO_2. This may be observed in the corresponding higher CO_2 values of Engine 6-0P in Appendix F, Tables F-6 through F-8. Also, past experience indicated that CO is power and carburetor sensitive, as would appear to be the case with CO from Engine 6-00 which had changes that involved a different head and carburetor.

During the course of the parametric study, several "running" checks of the parametric baseline engine were accomplished in order to ascertain overall performance repeatability. Table 40 also summarizes these results and generally attests to the acceptable repeatability of performance for the parametric baseline engine. For sake of comparison with other engine configurations employed later in this study, average values of the several baseline tests were used.

b. Nine-Mode EPA

As found earlier with the FTP procedure, the emissions using the EPA nine-mode procedure were also found to be very similar between the two baseline engines. These are listed on Table 40. The largest difference in emission levels was found in composite CO, 57 percent for Engine 6-0P relative to Engine 6-00. The diminished CO plus the slightly higher BSFC were attributed to the lower compression ratio and power levels of Engine 6-0P as well as the different carburetor.

A study of EPA nine-mode hp data in Appendix Tables F-42 through F-46 showed that Engine 6-0P produced less power than Engine 6-00. The reduction in power between baseline engines was not as severe as that found by the FTP nine-mode and explains why only a smaller (9 percent) in BSFC was obtained using Engine 6-0P by the EPA nine-mode test. Of course, it must be remembered that in the EPA nine-mode test, the engine is operated at specified percentages of maximum observed power.

c. EPA 23-Mode

Listed in Table 40 is the EPA 23-mode emissions summary for Engine 6. Although the overall data between engines are seen to be in good agreement, the FID, NO_2, and BSFC are slightly higher for the parametric baseline engine. As found earlier on the FTP and EPA nine-mode data, the CO of Engine 6-0P was lower than Engine 6-00. In this case, however, the difference in CO between the two engines was only 13 percent with respect to Engine 6-00.

It is interesting to note from Tables F-57 through F-62, that the power for Engine 6-00 was also larger than Engine 6-0P, but not by a great amount. For example, Engine 6-00 at 2300 rpm and at maximum power produced 132 hp compared to 125 for Engine 6-0P, a difference of 5 percent. The composite emission values of the 23-mode runs were generally in line with those obtained with the FTP and EPA nine-mode runs.

2. Parametric Evaluation

The nine-mode FTP was the basic procedure used to evaluate the effect of spark timing, carburetor jet size, EGR, catalysts, etc.

a. Effect of Timing

Several runs were made to determine the effect of basic engine spark timing on emissions and performance. In these runs and others following, the parametric baseline engine was employed. Engine 6-0P basic spark timing was set at 12°BTDC, standard timing (6°BTDC), TDC, and 6°ATDC. The results are plotted on Figure 16 and are composite data on a grams per bhp-hr basis. Cycle weighted BSFC as included on the figure is shown on a lb per bhp-hr basis.

Retarding the timing resulted in a general decrease of emissions. In absolute values, the change in emission levels was slight - between 12°BTDC and TDC. Percentagewise, NO_2 decreased by 15 percent from 12°BTDC to TDC with the greatest change, 9 percent, occurring between 12°BTDC to 6°BTDC. CO increased very slightly from 12°BTDC to 6°BTDC and then appeared to decrease linearly to 6°ATDC at which point it was somewhat lower than that at 12°BTDC.

Little change was evident for HC at the 12°BTDC, 6°BTDC, and TDC timing points. HC showed a marked drop from TDC to 6°ATDC, but the data at 6°ATDC for HC and other emissions is questionable, since the engine ran very erratic at this highly retarded spark timing. At 6°ATDC, most HC was believed to have been burned in the excessively hot exhaust system resulting from the extremely retarded timing. Except at 6°ATDC, the effect of timing on cycle BSFC was not very great although BSFC definitely increased with retarded timing. A significant loss in

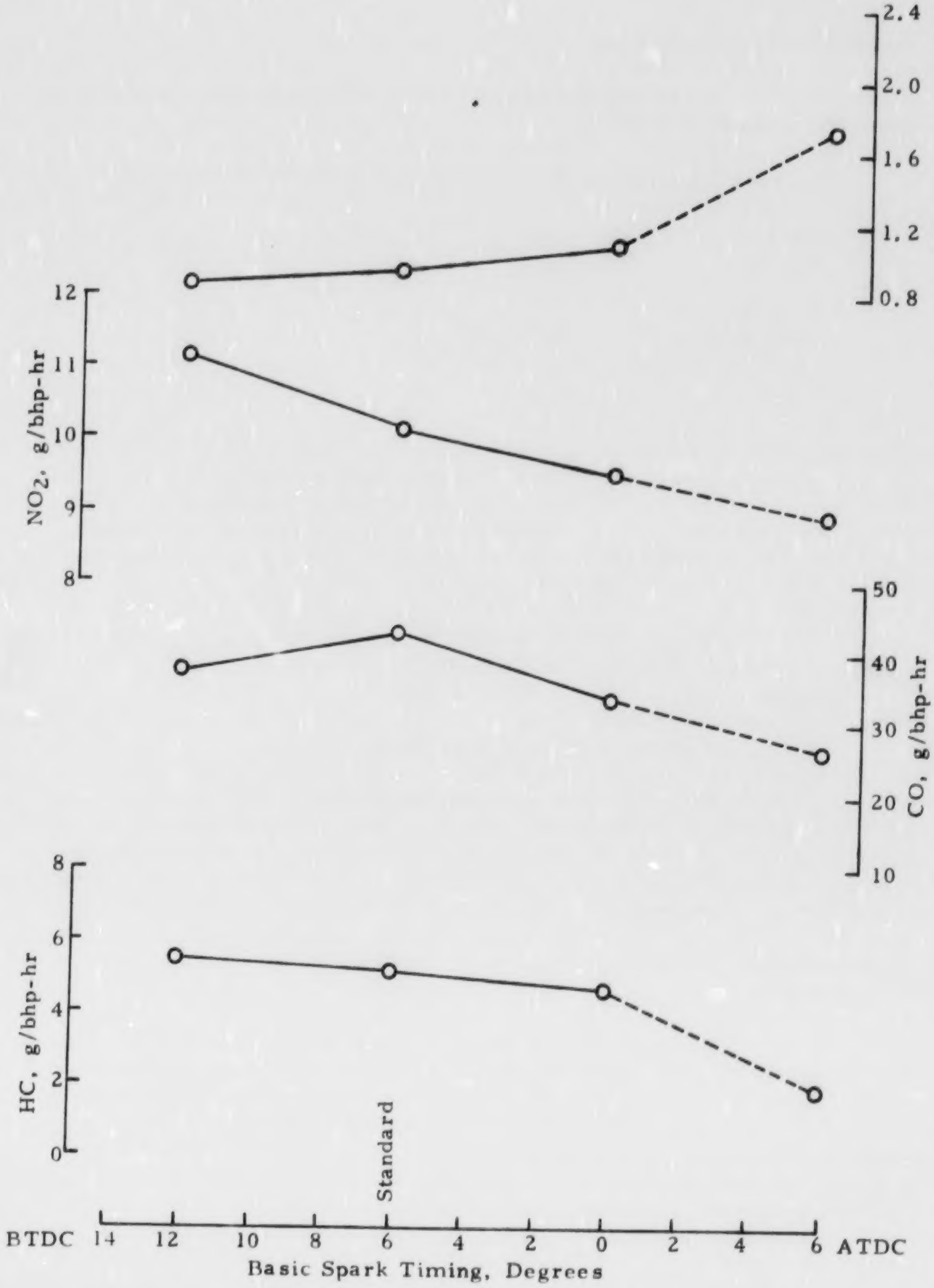

FIGURE 16. EFFECT OF SPARK TIMING ON EMISSIONS ENGINE 6-0P, 9-MODE FTP TEST

economy of operation is shown at 6°ATDC.

Retarding the timing resulted in measurable loss in observed power as summarized below:

Engine 6-0P, Power (Bhp) at Various Basic Spark Timings

Spark Timing	Manifold Vacuum, in. Hg. 3	10	16
12°BTDC	93	51	17
6°BTDC (Std.)	93	48	13
TDC	86	41	9
6°ATDC	70	28	2

If one may ignore the largest power losses experienced at 6°ATDC, where the engine ran erratically, then the most significant power losses with respect to 12°BTDC are evident at the 10 and 16 in. vacuums at TDC. Using TDC, a power loss of 20 percent occurred at the 10 in. vacuum and a loss of 47 percent at the 16 in. vacuum. The 3 in. vacuum point indicated only 8 percent power loss at TDC.

Tables F-6 through F-15 in Appendix F contain tabular computer printout-data for further modal analysis of the effect of timing on emissions.

b. Effect of Carburetor Jet Size

Figure 17 is a summary plot of the FTP nine-mode test results with various carburetor jet sizes. The numbers (No. 58, 59, 61, 62, 63, and 64) on the abscissa identify each jet as designated by the carburetor manufacturer, and also numerically designate the bore diameter of the jets as measured approximately in thousands of an inch. The standard jets (No. 612), which had different flow characteristics apparently due to a tapered inlet were found to best fit the plot somewhere between the No. 59 and 61 jets.

The plot showed that jet size had an important effect on the composite HC, CO, and NO_2 emissions. HC, although decreasing slightly, nevertheless showed an averaged drop in value with richer mixture. CO in the same instance showed a marked increase with richer mixture. This was expected based on earlier experience with a number of other gasoline engines. NO_2 indicated low and somewhat similar values (8 and 8.6 g/bhp-hr) at the extremes of the jet size range. From No. 58 to No. 63 jet sizes, NO_2 established an apparent plateau of about 10 g/bhp-hr.

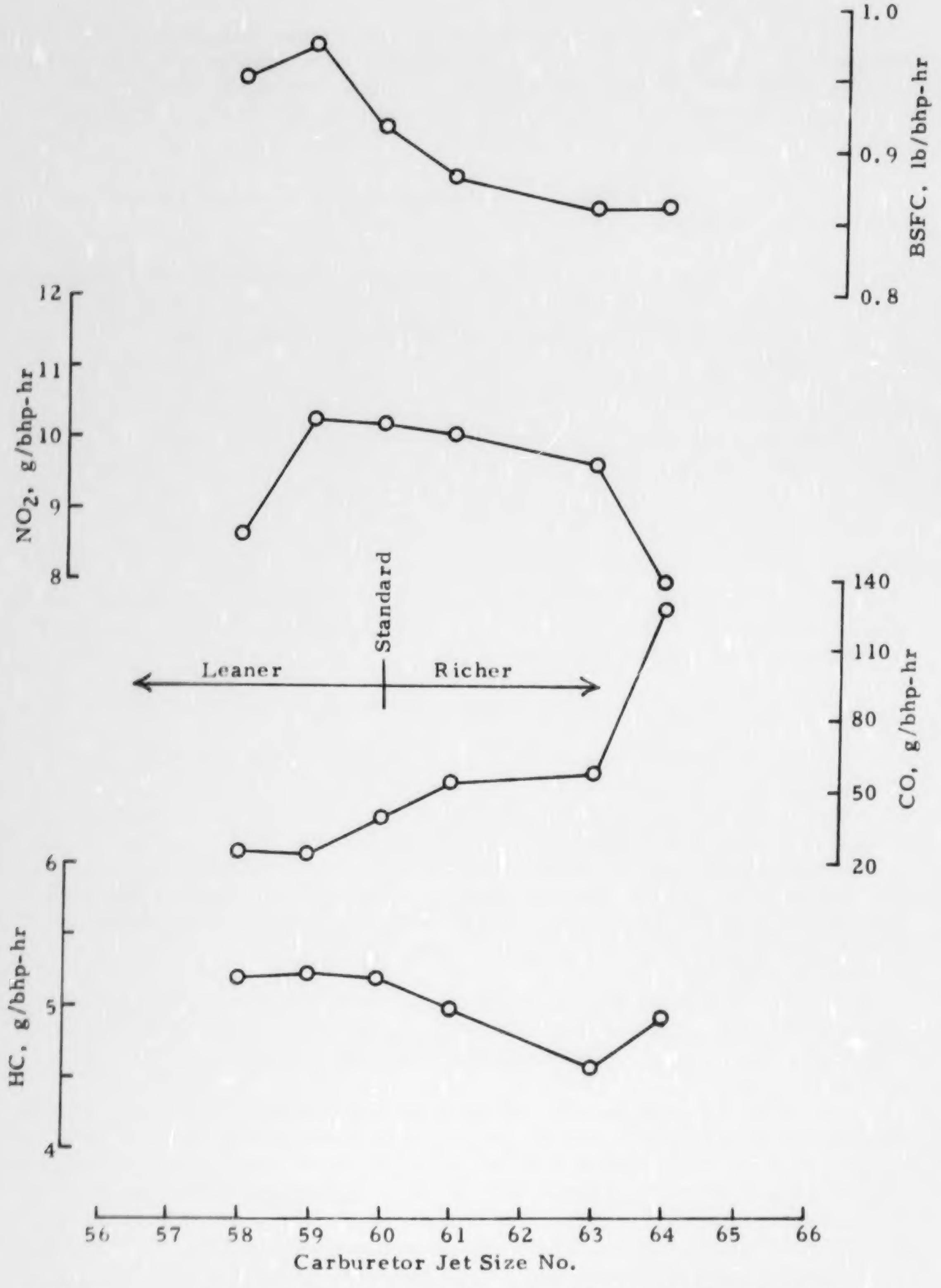

FIGURE 17. EFFECT OF CARBURETOR JET SIZE ON EMISSIONS ENGINE 6-0P, 9-MODE FTP TEST

BSFC was very sensitive to enriched mixtures as evidenced by the sharp decline in its value from about 0.91 g/bhp-hr with the standard jets to 0.86 g/bhp-hr with the 64 jets. A leaner mixture from standard jets indicated BSFC rising to 0.98 g/bhp-hr with the 59 jets and thereafter slightly less with the 58 jets.

The enrichment of fuel resulted in increased power as indicated in Table 41.

TABLE 41. ENGINE 6-0P, POWER (BHP) WITH VARIOUS JET SIZE NUMBER

Jet Size No.	Manifold Vacuum, in. Hg 3	10	16
58	87	43	10
59	89	45	11
Std.	93	48	13
61	93	50	18
63	95	55	19
64	95	55	21

Compared to standard jets, the 64 jets, or richest mixture, contributed power increases of 2, 15, and 62 percent at the 3, 10, and 16 inch manifold vacuums, respectively.

c. Effect of Decel Throttle Modulator (Described in Sec. XI. D.)

The parametric baseline engine (6-0P) was fitted with the decel throttle modulator provided by the engine manufacturer. A point of interest is that the engine as used with the modulator is identical to the 1973 California baseline engine. In this parametric study, the use of the modulator was to determine its effect on the closed throttle 2000 rpm motoring mode hydrocarbon emissions. It was not used during the parametric study of timing and carburetor jets in order to investigate their effects singly.

Listed in Table 42 are the composite emission (grams/bhp-hr) and BSFC (lb/bhp-hr) results of the parametric baseline engine with and without decel modulator by the nine-mode FTP.

Composite HC values were reduced by 76 percent. There is little doubt that the modulator served to reduce HC emissions. From Tables F-6 and F-23 of Appendix F, it is seen that the modulator reduced, at CT, the parametric baseline HC-NDIR by approximately 96 percent. The slightly higher CO and NO_2 values shown for the parametric engine with modulator were not of great concern since "running" baseline checks on the parametric engine have at times indicated similarly valued

TABLE 42. EFFECT OF THROTTLE MODULATOR ON ENGINE 6-0P EMISSIONS

Engine 6-0P	Grams per Bhp-Hour HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lb/Bhp-Hr
w/o Modulator	5.1	6.9	41.7	10.2	9.8	0.91
w/ Modulator	1.2	2.7	45.3	11.2	10.9	0.93

composite CO and NO_2 emissions. The BSFC with modulator did indicate a slight fuel penalty since operation of the modulator increased fuel consumption during the CT mode by 30 percent.

d. Effect of Air Injection

Engine 6 did not have an air injection system as provided by the manufacturer. Accordingly, a system was prepared and adapted to the engine using an available air pump. The exhaust manifold was fitted with six long reach air delivery tubes, made of 1/4 inch diameter stainless steel with the end of each located at the exhaust valve underhead. An air distribution manifold was used to furnish air to each tube from the engine driven air pump. The system was essentially identical to other air injection systems of a research nature and was satisfactory for purposes of this project.

A summary for comparison of composite emissions (grams/bhp-hr) and BSFC(lb/bhp-hr) between the air injected engine configurations and the parametric baseline is shown in Table 43. The nine-mode FTP was run with and without air injection during the CT mode to investigate the effect of air on HC emissions during this mode. As shown in Table 43, air injection was effective on CO.

TABLE 43. EFFECT OF AIR INJECTION ON ENGINE 6-0P EMISSIONS

Engine 6-0P	Grams Per Bhp-Hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lb/Bhp-Hr
Parametric	5.1	6.9	41.7	10.2	9.8	0.91
Air Injection	5.4	6.2	20.4	11.9	11.6	0.92
Air Injection except at CT	5.3	5.5	21.5	11.9	10.7	0.93

Composite CO was reduced by 51 percent with air injection throughout the FTP and by 48 percent with air injection at all modes except at closed throttle.

In the run with air injection except at CT, the vacuum-operated valve controlling the air injected system was set to by-pass the air to atmosphere at CT. The valve not only effectively did this at CT but also did it at the 19 in. mode. Apparently the valve began dumping air to atmosphere somewhere around 19 in. of vacuum, but the net effect on the 19 in. emissions was minimal. Apart from the fact that injected air at CT helped to decrease the CO somewhat further, the results from the two air-injected runs were essentially alike. With regard to HC, it did not seem to matter whether air was injected at CT and the 19 in. modes or not. This was evident by the nine-mode FTP HC by NDIR and FID. For further details on this test series, please refer to Tables F-21 and F-22.

e. Effect of EGR

Engine 6 did not have a factory equipped EGR system so a retrofit type EGR was used. Two large openings were machined in the existent carburetor spacer, one per carburetor barrel. The outlet of the EGR valve was piped to each of the spacer openings through a Y-connection. The inlet side of the EGR valve was connected to the exhaust pipe section immediately extending from the exhaust manifold. The EGR vacuum signal was derived from one of four small ports drilled in the carburetor housing at different distances above the carburetor throttle plate.

A survey was conducted to investigate the vacuum pressures at each port. The port ultimately selected (the remaining three ports were plugged) displayed vacuum signals of 2.2, 7.4, 2.0, and 0.5 in. Hg at respective manifold vacuums of 3, 10, 16, and 19 in. Hg. These vacuum signal strengths were sufficient to operate either of two EGR valves used in the study. One EGR valve, used earlier with Engine 4-1 and known as EGR 4-1, was employed in the parametric study and was adjusted for initial opening at 1.5 in. Hg and for full opening at 7.4 in. Hg. The second EGR valve, EGR 2-1, was that used with Engine 2-1. EGR 2-1 had a reverse pintle compared to EGR 4-1; that is, maximum flow area was attained at 2.2 in. Hg.

Table 44 lists the emission and BSFC results obtained with EGR valves 4-1 and 2-1 as well as results from a simulated run obtained using a manually operated valve in place of a standard EGR valve. Composite emission and BSFC results using EGR 4-1 are plotted for the various valve pintles available in Figures 18 and 19 for the FTP and EPA nine-mode results respectively.

Results for the nine-mode FTP EGR runs in Table 44 indicate that the parametric baseline NO_2 level was effectively reduced by EGR. In all emission categories, quite similar results were obtained with EGR 4-1 and 2-1. EGR 4-1, with the 15 percent pintle, and EGR 2-1,

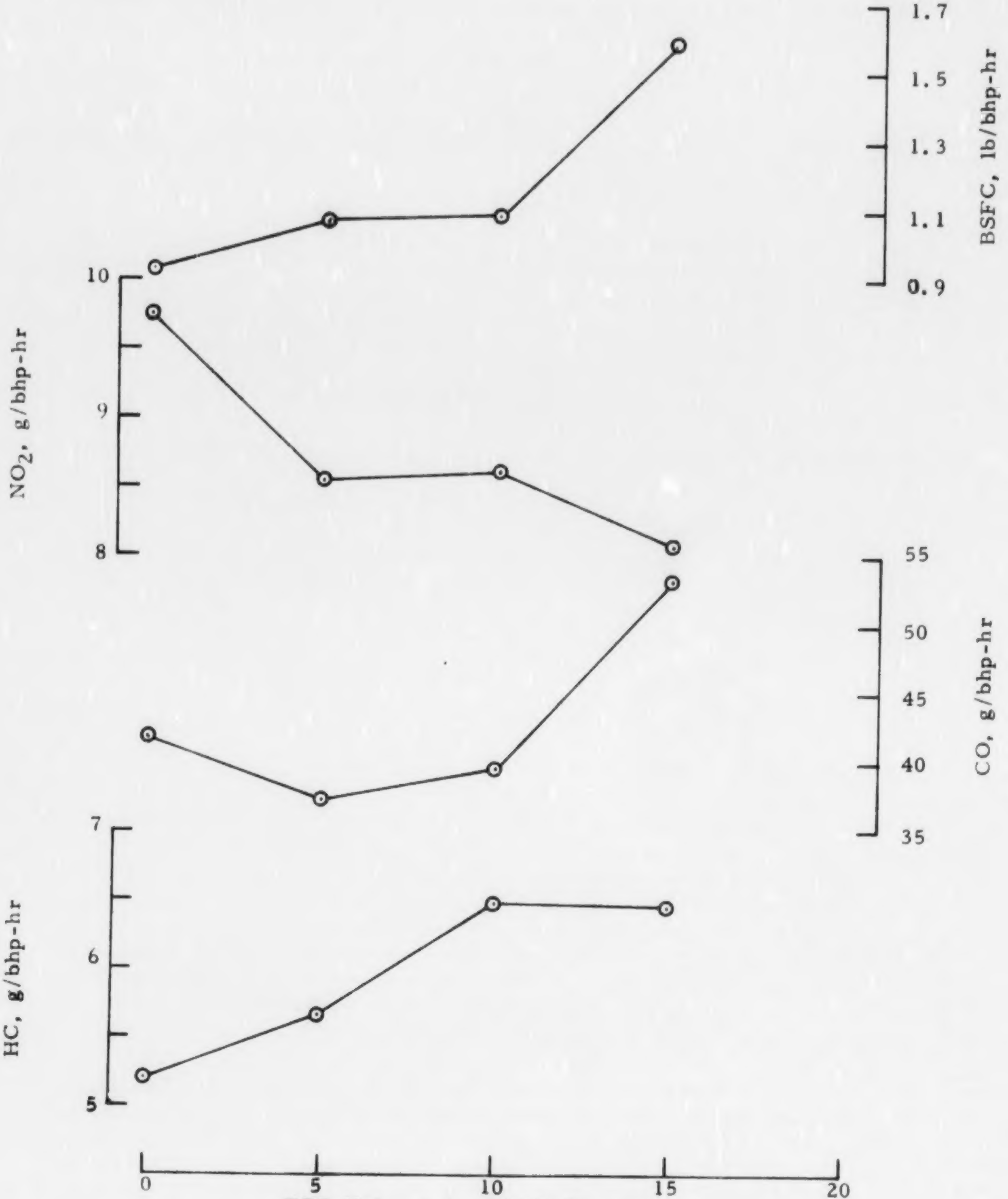

FIGURE 18. EFFECT OF EGR ON EMISSIONS
ENGINE 6-OP, 9-MODE FTP TEST

TABLE 44. NINE-MODE EMISSIONS SUMMARY OF EFFECT OF EGR

			Average Composite Emissions Grams/Bhp-Hr					Cycle
			HC		CO	NO_2		BSFC
Test	Run	EGR	NDIR	FID	NDIR	NDIR	CL	Lbs/Bhp-Hr
			Nine-Mode FTP					
64	1	4-1, pintle 5	5.7	7.8	37.4	8.6	8.2	1.08
64	2	4-1, pintle 10	6.7	8.6	39.5	8.6	8.1	1.09
64	3	4-1, pintle 15	6.5	8.7	53.2	8.1	7.2	1.59
64	4	2-1	6.2	8.1	31.2	7.5	7.1	1.13
64	5	2-1, 63 jets	5.3	8.8	95.4	7.4	6.4	0.97
64	x	Simulated, 63 jets	6.3	10.0	109.1	6.3	5.9	1.07
Parametric Baseline			5.1	6.9	41.7	10.2	9.8	0.91
			Nine-Mode EPA					
65	2	4-1, pintle 5	3.4	5.3	45.7	8.5	8.0	0.78
65	1	4-1, pintle 10	3.2	4.5	30.6	6.6	6.1	0.78
65	3	4-1, pintle 15	3.8	4.2	46.5	5.2	4.7	0.79
65	4	2-1	3.7	5.5	42.9	8.4	8.1	0.78
65	Y	Simulated	3.3	5.6	65.2	5.4	5.1	0.78
Parametric Baseline			3.5	4.7	31.9	11.3	10.8	0.74

with No. 63 carburetor jets, indicated larger variation in CO when compared to other runs with EGR 4-1 and 2-1. Whereas the other runs averaged 36.0 g/bhp-hr in CO level, the run with the 15 percent pintle produced a somewhat higher CO emission level of 53.2 g/bhp-hr. Run 5, using EGR valve 2-1 and the richer fuel mixture, produced an even higher CO level of 95.4 g/bhp-hr. Cycle weighted BSFC was found to deviate very slightly between most of the runs accomplished with EGR 4-1 and 2-1. Only the 15 percent pintle in Run 3 appeared to significantly increase the BSFC to 1.59 lbs/bhp-hr.

A manually-operated valve was substituted for the standard EGR valves and used at various selected openings to achieve minimum NO_2 emissions during the 3, 10, and 16 in. power modes. Concurrently with this study, several sizes of carburetor jets were also evaluated for improved NO_2 emissions. The optimum NO_2 emissions thus obtained, along with the other emission types regularly monitored in the indicated power modes were then used to prepare the simulated Run x found in Test 64 of Table 44. Modal data of the parametric baseline engine provided the remainder of the emission data for the idle, CT, and 19 in. modes used in the simulated run. The simulated run presented the lowest NDIR and CL NO_2 emission levels in the entire EGR study. The highest levels of HC-FID and CO emissions were also found, however, with the simulated EGR run.

The EGR percent rates for the respective pintles used in Test 64 were obtained by comparing NO_x-CL emission levels at the intake and exhaust manifolds. The sampling at the manifolds was undertaken only at the 3, 10, and 16" power modes. Sampling of the intake manifold gas stream was facilitated by preparing four small ports on the intake manifold in regions close to each intake valve. The four ports were plumbed to a common sample line leading to the NO_x-CL emission analyzer. The resultant EGR rates and respective EGR temperatures obtained in Test 64 runs were as follows:

EGR	Pintle, %	Exhaust Manifold Vac., in. Hg	EGR Rate, Percent*	EGR Temp. °F
4-1	5	16	5	630
4-1	5	10	6	985
4-1	5	3	1	640
4-1	10	16	6	790
4-1	10	10	8	1060
4-1	10	3	2	893
4-1	15	16	7	785
4-1	15	10	11	1122
4-1	15	3	3	976
2-1	--	16	11	1253
2-1	--	10	7	1399
2-1	--	3	3	1433

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*Not corrected for water of combustion.

An extensive parametric evaluation of the EGR systems was determined with the EPA nine-mode procedure since EGR effects the modal relationship. Shown in Table 44 are the emission results of the runs obtained with EGR valves 4-1 and 2-1. Some results obtained with a simulated EGR run are also given in Table 44. Figure 19 is a plot of composite emission and BSFC results using EGR valve

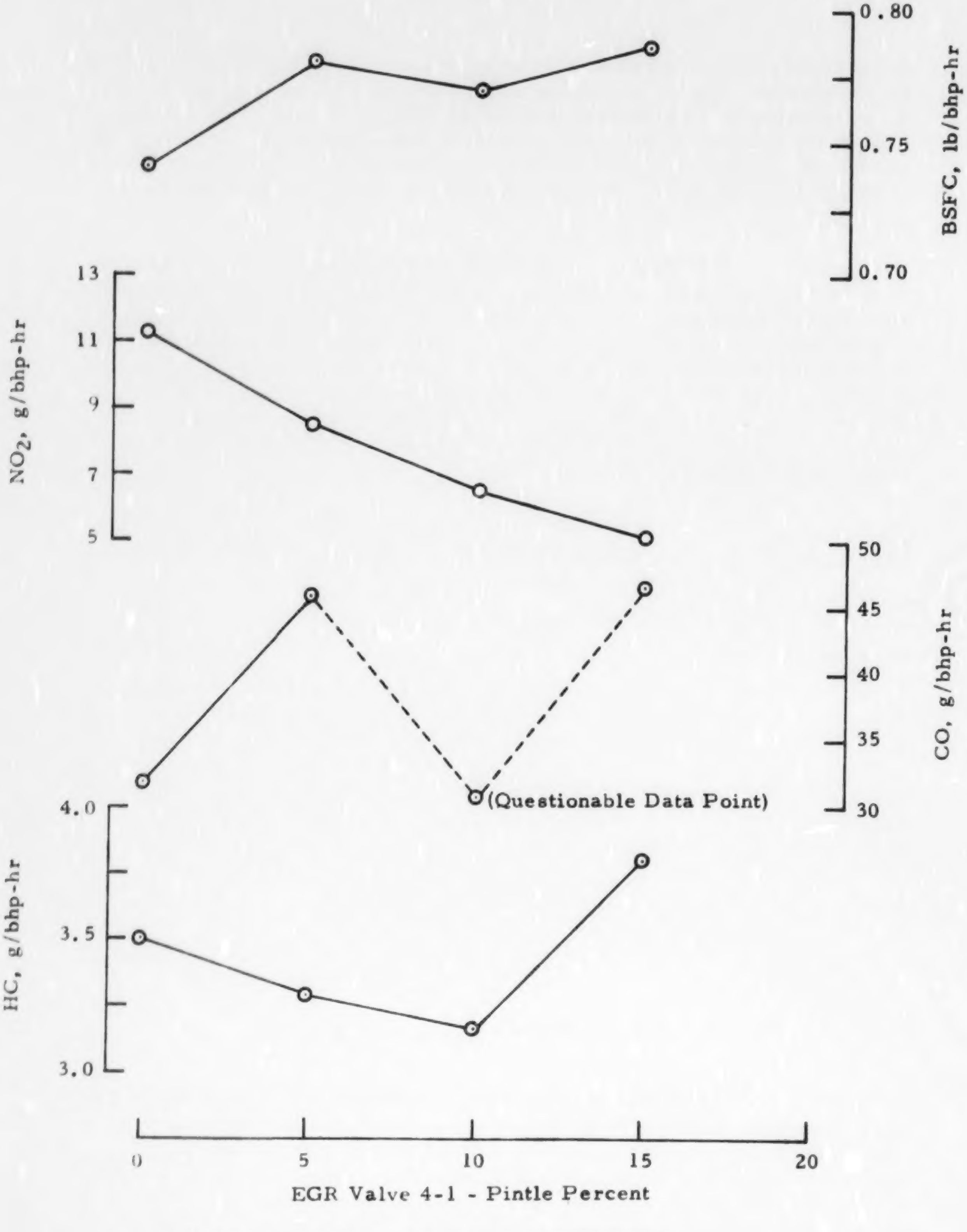

FIGURE 19. EFFECT OF EGR ON EMISSIONS
ENGINE 6-OP, NINE-MODE EPA

4-1 with the various pintles available. Hydrocarbon emissions remained fairly consistent on Test 65, Runs 1 through 4, Table 44, and very much in accord with respective NDIR and FID HC values of the parametric baseline engine. For the same runs, NO_2-NDIR emissions varied from 25 to 54 percent lower than the parametric baseline. The smallest NO_2 emissions were obtained with EGR 4-1 using the 15 percent pintle.

Excluding CO data of EGR valve 4-1 with the 10 percent pintle, the CO levels in the EGR study ranged from about 34 to 46 percent higher than baseline. EGR 4-1 with the 10 percent pintle produced CO at just below the level of baseline, i.e., 30.6 g/bhp-hr to 31.9 g/bhp-hr. The reason for this significant drop in CO compared to the other EGR runs in Table 44 was caused by inadvertently setting the carburetor idle adjustment too low. This in turn caused a marked drop in CO levels at the idle, 19 in. and CT modes thereby reducing the CO four-cycle composite value in Run 1 of Test 65. It did not appear that other emissions were similarly affected by the low idle adjustment in Run 1.

The cycle weighted BSFC with EGR remained remarkably constant throughout the EGR runs at approximately 0.78 lbs/bhp-hr, or about five percent higher than the 0.74 lbs/bhp-hr obtained with the baseline engine.

In Run Y of Test 65, results from a simulated EGR run are presented. The run was prepared similarly to the FTP nine-mode simulated EGR run discussed earlier, but run according to the EPA procedure. The results of Test Y in Table 44 show generally excellent agreement with Runs 1 and 3 which presented lower overall emissions. However, the simulated run did show significantly higher CO than Run 1 and 3. In fact, CO was higher than any other runs in the EGR study conducted with this procedure.

f. Effect of Oxidation Catalyst (Monolith)

As discussed earlier inthis report, the oxidation catalyst used in this study were designed for engines with dual exhausts and with displacements similar to Engine 6. Therefore a Y exhaust section was fabricated for connection to the single exhaust manifold of the parametric configuration engine to provide parallel adaptation of the two oxidation catalysts to the engine. Exhaust from the oxidation catalysts was channeled to another Y which was in turn connected to a single exhaust to complete the overall exhaust system. No muffler was used.

In comparing the HC-NDIR and HC-FID data in Table 45, the differences in values obtained between the two types of HC analyzers should be noted. This is explained on the basis that the sensitivity of the HC-NDIR analyzer at the low values obtained in this study is

TABLE 45. EMISSIONS SUMMARY OF EFFECT OF OXIDATION CATALYSTS AND VARIOUS CONTROL PARAMETERS - ENGINE 6

			Average Composite Emissions Grams/Bhp-Hr					
			HC		CO	NO_2		
Test	Run	Control Parameter	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp-Hr
		Nine-Mode FTP						
60	2	Air, Decel	0.8	0.07	4.5	11.1	11.1	0.96
60	3	Decel	0.9	0.68	19.9	7.8	7.5	0.94
60	4	Air, Decel, TDC	0.9	0.03	6.2	9.7	9.4	1.18
60	5	Air, Decel, TDC 59 Jets	1.0	0.05	7.1	10.1	9.7	1.25
74	1, 2	Air, EGR 10, 63 Jets	1.4	0.06	5.2	6.9	6.5	1.11
75	1, 2	Air, EGR 10	1.5	0.11	6.8	9.9	8.8	1.25
Parametric Baseline, Avg.			5.1	6.9	41.7	10.2	9.8	0.91
		Nine-Mode EPA						
76	1, 2	Air, EGR 10	1.2	0.26	3.9	7.3	7.0	0.77
Parametric Baseline			3.5	4.7	31.9	11.3	10.8	0.74
		23-Mode EPA						
77	1, 2	Air, EGR 10	---	0.20	24.3	---	6.9	0.78
Parametric Baseline			---	6.32	68.4	---	9.8	0.74

questionable. Similar inconsistencies in HC-NDIR values were found in some other work covered in this report, especially where the HC was greatly reduced by selected control parameters such as oxidation catalysts. For purposes of comparison between runs, the HC-FID data is used exclusively in this evaluation and where needed in subsequent runs.

The effect of the oxidation catalyst plus air is shown by comparing Test 60 Run 2 with the parametric baseline. The important effect of air injection in reducing HC and CO is made clear in Test 60, Runs 2 versus 3. With air injection, the oxidation catalyst appears to convert essentially all HC and CO emissions. Run 3 was the single run not employing air injection and immediately points to larger HC and CO contributions.

In Test 60, without EGR, one would expect the NO_2 emissions to remain close to those of the parametric baseline engine. Except for Run 3 without air injection, this is the case as shown in Table 45. The fact that NO_2 is significantly smaller in Run 3 may be due to catalytic reduction of NO occuring in the catalyst as a result of the CO rich and oxygen deficient exhaust. The reduction of NO_2 in Run 3 was most significant in the 3 inch condition as may be seen in Appendix F, Table F-35.

In this study of oxidation catalyst effects, several runs were performed employing various combinations of air injection, timing, carburetor jets, EGR, and decel-throttle modulator. Standard carburetor jets and No. 63 jets, found in the simulated EGR run to provide low NO_2 emissions, were evaluated in combination with the oxidation catalysts. From the study of EGR effects, EGR valve 4-1 with 10 percent pintle was considered a good compromise for use with the oxidation catalysts. Table 45 summarizes the runs conducted employing the oxidation catalysts plus control parameters previously mentioned.

In Table 45, a marked reduction in HC-FID, CO, and NO_2 occurred in Test 74 employing the oxidation catalysts, air injection, and 63 carburetor jets. Compared to the parametric baseline results, HC-FID was reduced by 99 percent, CO by 88 percent, NO_2-NDIR by 32 percent. Run 75 conducted with the same equipment as Test 74 but with standard carburetor jets, presented similar HC-FID and CO emission levels. However, NO_2-NDIR is seen, in Test 75, to have been reduced by only 3 percent when compared to the parametric baseline average.

BSFC increases in Test 74, 75 and 60, as compared to the parametric baseline engine, were more pronounced in Test 75 and in Run 5 of Test 60. Here, cycle weighted BSFC increased by 37 percent. Closest to these large BSFC increases were Test 74 and Run 4 of Test 60 with increases of 22 and 30 percent, respectively. The remaining two runs (Test 60, Runs 2 and 3) showed a much lower BSFC increase of only 4 percent.

The results of the EPA nine-mode runs with oxidation catalysts, air injection, and EGR with the 10 percent pintle are also presented and compared against the parametric baseline results in Table 45. The emission data illustrates the significant effect of the oxidation catalysts, air injection, and EGR in reducing overall emissions. The selection of EGR 4-1 with the 10 percent pintle resulted from a careful study of EGR effects which indicated a good compromise for use with the oxidation catalyst.

A comparison of Test 86 and Test 75 in Table 45 shows very good agreement in respective emission levels. However, cycle weighted BSFC was noticeably lower in the EPA nine-mode test. The EPA nine-mode BSFC was 38 percent lower than that of the FTP nine-mode test.

The 23-mode emission rates for the oxidation catalysts, air injection, and EGR test are shown at the bottom of Table 45 and include the 23-mode parametric baseline results for comparison. All emissions were effectively reduced with the oxidation catalysts. Parametric baseline HC, CO, and NO_2 were reduced by 97, 64 and 30 percent respectively. The BSFC in Test 77 increased 5 percent using the oxidation catalysts, air injection, and EGR with the 10 percent pintle.

3. Effect of Reduction Catalyst

Since Engine 6 was scheduled to be run in a vehicle, a practical approach was taken in the optimization of the reduction catalysts. Optimization requirements prescribed by the catalyst manufacturer could be readily met with minimal modifications and controls.

Engine 6 was an inline six cylinder, whereas the reduction catalysts were designed for a dual exhaust manifold system and two units were required for an engine of this displacement. (It should be pointed out that all of the oxidation catalysts used in this project were also designed for engines with dual exhaust manifolds.) Therefore, an exhaust section, shaped like a capital Y, was fabricated and the leg of the Y was connected to the exhaust manifold to uniformly divide the exhaust into two streams. The two reduction catalysts were then connected to the two arms of the Y. The total distance from the outlet of the exhaust manifold to the inlet of the reduction catalyst was approximately twelve inches, thereby minimizing the drop in exhaust gas temperature. Provisions were made to supply a small amount of the air from the air pump just before the reduction catalysts and the bulk of the air just before the oxidation catalyst.

The manufacturers recommended operating conditions for optimum performance of the reduction catalysts were as follows:

Catalyst Temperature

Lowest for efficient operation	1150°F
Maximum sustained operation	1800°F
Maximum ever	2100°F

Exhaust CO Content

Lowest for efficient operation	2.2% CO
Nominal best range	2.2% to 3.0% CO
Maximum	4.0% CO
Nominal best CO/O_2 Ratio	2 to 3

The optimization of the reduction catalysts on Engine 6 was carried out as follows.

Based on the parametric evaluation of carburetor jets (Test 57) the size number 64 jets were selected as having essentially the desired operating characteristics and were installed. Several check runs were made with sampling of the exhaust before the reduction catalysts and the nominal CO and NO_x values were as follows:

Mode	CO, %	NO_x, ppm
Idle	2.2	100
CT	0.8	100
19 inches Hg	2.0	200
16 inches Hg	3.5	300
10 inches Hg	2.2	1200
3 inches Hg	2.6	1800

With the exception of the idle modes, the reduction catalyst temperature was consistently greater than the 1150°F recommended minimum. At idle the catalyst temperature was approximately 1000°F.

Using a hand operated valve to control the supply of air to the reduction catalysts, the modes in the nine-mode FTP procedure were individually optimized. (The reason for supplying a small quantity of air to the reduction catalyst is to minimize the production of ammonia which subsequently is converted back to NO_x). With careful adjustment of the control valve, NO_x values below 10 ppm could be attained at all but the 3 inch Hg mode. The control valve was then replaced with a fixed orifice sized to provide the best overall reduction of NO_x. The resultant nominal modal values with the engine fully warmed-up were:

Mode, inch Hg.	NO_x, ppm	O_2, %	CO/O_2
19	5	1.1	2
16	10	0.9	4
10	15	0.5	4
3	20	0.4	6

Although the CO/O_2 ratio does not remain in the recommended range of 2 to 3, the composite of these NO_x values with the orifice are only some fifty percent higher than the composite values obtained when the modes were individually optimized. At this point any further reduction in NO_x would require fairly extensive carburetor modifications and/or a more complicated air control system. This same orifice system provided the optimum NO_2 reductions by the nine-mode EPA procedure that could be obtained in a practical manner.

A nine-mode FTP test (Test 61 in Table 46) was then made and composite NO_2 values by CL were found to be only about two percent of the baseline values (Tests 55, 58, 63 and 79). Composite NO_2 values by NDIR were about three to four percent of the baseline values. A single run made without supplying any air to the reduction catalyst (Test 62) resulted in composite NO_2 values some six times higher than when air was supplied. A determination with one size leaner carburetor jets resulted in a significant increase in composite NO_2 with no significant change in HC, CO or BSFC.

One problem observed with this particular reduction catalyst was the rather high increase in exhaust backpressure. For example, at the 3 inch Hg mode, the backpressure before the reduction catalyst was 4.1 inches of mercury vs 1.4 inches after the catalyst. At 2300 rpm WOT the backpressure was 6.2 before and 2.6 inches Hg after. The catalyst manufacturer stated this situation has occurred in the past with this particular model of catalyst. In addition to the rather initially tight matrix and the exhaust deflector, it was stated that the nickel in the catalyst has been found to permanently oxidize and in so doing partially restrict the already narrow passageways. A new improved model has reportedly been designed which minimizes the restriction to exhaust flow and thereby the exhaust backpressure.

Composite BSFC in the controlled configuration was increased over the baseline configuration as follows:

Test Procedure	Increase in BSFC, Percent
9-Mode FTP	2
9-Mode EPA	10
23-Mode EPA	13

The items which increased and/or decreased the nine-mode FTP composite BSFC of the controlled configuration versus the parametric baseline engine include:

	Effect on BSFC
Richer Jets	Decreased
Air Pump & Oxy. Cat	Increased
Reduction Cat.	Increased
Net Effect	Slight Increase

In summary, with the reduction catalysts (using only a simple air manifold system and richer carburetor jets) NO_2 composite reductions of greater than 95 percent were obtained by all of the three test procedures. This particular model of reduction catalyst produced rather high exhaust backpressure which had a significant effect on power output at or near the WOT conditions. (It should be noted that any effect at the WOT condition affects the overall results obtained using the nine- and 23-mode EPA procedures).

3. "Best-Combination" Configuration

Presented in Table 46 is the FTP nine-mode, EPA nine-mode and EPA 23-mode emissions summary as compiled using the "Best-Combination" configuration engine with reduction catalysts and other control parameters. For each test procedure presented, the corresponding parametric baseline data as obtained with that procedure is included for comparison of emission levels and cycle weighted BSFC.

Prior to finalizing the "best-combination" engine configuration, the merit of using the decel throttle modulator was considered. A comparison of runs made with and without decel modulator indicated all CT emissions were virtually unaffected by the decel modulator. This was because of the activity of the oxidation catalyst. Moreover, a penalty of approximately 29 percent increase fuel consumption was noted at CT with the decel modulator using the FTP and EPA nine-mode procedures. The conclusion was that the decel demodulator would not be included in the "best-combination" configuration.

Since the reduction catalyst-oxidation catalyst system with modified carburetor and air injection system resulted in the best overall reductions in emissions, it was considered the best control combination. Accordingly, this system was selected for evaluation in the truck on the road and chassis dynamometer.

C. Chassis Operated Results

The engine was installed in a 1970 cabover White compact two axle truck tractor, ABC number 351 license V 29421. The tractor was equipped with a 5 speed forward transmission and two speed rear axle with 10.00-20 tires. The normal trailer used with this tractor in city delivery, urban-

TABLE 46. EMISSIONS SUMMARY FOR "BEST-COMBINATION" CONFIGURATIONS

Test	Run	Control Parameter	Average Composite Emissions Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lbs/Bhp-Hr
		Nine-Mode FTP						
61	1, 2, 3	R-Cat, O-Cat, Air, 64 Jets	0.7	0.3	3.1	0.4	0.2	0.93
62	1	R-Cat, O-Cat, No Air to R-Cat, 64 Jets	0.3	0.4	3.8	2.2	1.4	0.93
Parametric Baseline		--	5.1	6.9	41.7	10.2	9.8	0.91
		Nine-Mode EPA						
68	1, 2, 3	R-Cat, O-Cat, Air, 64 Jets	0.8	0.3	2.7	0.5	0.3	0.81
Parametric Baseline		--	3.5	4.7	31.9	11.3	10.8	0.74
		23-Mode EPA						
67	1, 2, 3	O-Cat, Air 64 Jets	---	0.5	34.5	---	0.4	0.83
Parametric Baseline		--	---	6.3	68.4	---	9.8	0.74

suburban service, is dual 10.00-20 (alternative 9.00-20) size tires on a single rear trailer axle. This makes up a fairly maneuverable 3 axle tractor semi-trailer rig which is most common. For purposes of this project, the same single axle trailer previously used for Engine 1 was used. The odometer reading was 54,877 miles at the beginning and 55,123 miles at the end of the vehicle test sequence.

1. Road

As with trucks used with Engines 2 and 4, which had a similar

5 forward speed transmission and two speed rear axle, vehicle 6 was found to operate most acceptably on the road and on the dynamometer in the high axle position and, as usual, 1st gear was not employed. All driving followed normal driving habit and shift patterns and only hi-axle position was employed.

Given that the drive axle and the trailer axle can each handle 18,000 lbs. and the front axle can handle 9,000 lbs for a total of 45,000 lbs, then the test weight was computed as half the difference between the GCW (gross combined weight) of 45,000 lbs and the empty weight of the tractor-trailer combination of 12,750 lbs added to the empty weight. Accordingly, the test weight was 28,875 lbs. Weather conditions were quite stable throughout the test period with little or no wind or inclement weather. Wet/Dry bulb temperatures and barometric pressures were quite stable.

a. Cold Start Driveaway

All tests were made with a minimum overnight soak of 16 hours before start. Soak temperature was between 70-75°F at night outside for these tests. Bleed down of the airbrake air precluded rolling the truck until air pressure reached 75 psig, which would negate the cold start.

Engine 6 performed over the cold start driveaway route about as well with either engine configuration. This was the first gasoline powered tractor evaluated and it definitely lacked the ability to achieve the speeds with the 28,875 lb test weight. This was demonstrated during the practice run over the course during which time all maximum speeds from part throttle (PT) and wide open throttle (WOT) were reduced 5 miles per hour. This was necessary regardless of shift pattern and whether the "hi" or "lo" rear axle or split shifting was employed. The power to weight ratio of this truck was insufficient to reach the nominal speeds of the procedure. Most trucks studied in this project were able to operate well at 5 miles per hour above the procedure accel speed. The procedure anticipated this possibility and gave the test engineer the latitude to adjust the top speed ± 5 mph depending on vehicle performance.

Since both engine configurations reacted so identically throughout the cold start, both will be described together. The initial starts were mainly routine with Engine 6-0P first start after 5 seconds of cranking while Engine 6-1 started after 7 seconds of cranking. About half choke (manual) was used and as soon after engine start as possible, the engine speed raised to 1000 rpm by the foot accelerator pedal.

This is a different practice than used on other trucks but was necessary to build up sufficient air pressure to release the tractor and trailer brakes. Actually this practice is fairly conventional with truck drivers. It required 75 seconds with Engine 6-0P and 70 seconds for Engine 6-1 to reach 70 psig at which time the engines were allowed to idle still with half choke and of course the air compressor continued to operate and build air pressure. During the ensuing 28 second curb idle, Engine 6-0P idled M rough quality at 600 rpm while Engine 6-1 idled satisfactory also at 600 rpm. After the clearing operation, Engine 6-0P increased to 650 rpm and T rough idle quality for the final 25 seconds of the low idle start sequence. Engine 6-1, however, continued to idle at 600 rpm yet with a T roughness. The cold start is a fairly important aspect of this test procedure and both had no difficulty in starting. The T to M idle roughness should be viewed in terms of the air compressor operation which is different from many other gasoline trucks in heavy duty operation.

The next operation was part throttle accel to 20 mph using 2nd and 3rd gears. For consistency, accels were usually made to 3000 rpm before upshifting. For both Engines 6-0P and 6-1, the PT operation was termed mostly a heavy PT with 4 to 8 inches vacuum necessary since the truck would not move at a moderate to light PT. As the vehicles reached 20 mph, instead of the nominal 25 of the procedure, the transmission was upshifted to fourth for the WOT uphill from 20 mph next. Both engine configurations exhibited mostly satisfactory drive-away characteristics with Engine 6-0P having a T stumble in the 2nd gear acceleration.

The uphill WOT in fourth resulted in little increase in speed with 22 mph being reached before the CT decel to stop. Except for an obvious lack of power to accelerate the vehicle up the hill, both configurations performed satisfactorily from a driveability standpoint.

During the next CT decel and all other decelerations over the driving course, both PT and CT, no exhaust backfires, popping or other exhaust noise was discernible. Engine 6-0P was operated using the standard stock muffler whereas Engine 6-1 used a pair of reduction followed by a pair of oxidation catalysts but no other muffler or silencer. Apparently, the two pair of catalysts were sufficient to quiet the engine and even the use of the air pump did not affect the exhaust noise characteristics.

Following the first stop, at which the choke was changed to the "one-quarter out" position, another PT accel was made to 20 mph. This accel was uneventful in so much as driveability is concerned as no stumble, hesitation, stall, or stretchy-lean operation was noted. After decelerating at CT downhill to another stop, during which no other abnormal exhaust noise was noted, the engine choke was moved completely in. Next, a WOT accel in 2nd to 4th gear was made to 30 instead of 35 mph. Neither engine configuration exhibited unsatisfactory driveability.

Following another CT decel to stop, another PT accel to 20, instead of nominal 25 mph, was made with satisfactory driveability noted, in both second and third gears for both engines. After upshift to fourth, the vehicle was accelerated at WOT to 30, instead of the nominal 35 mph of the procedure, and then CT decel to 20 mph cruise followed by another WOT to 30 mph in 4th. This pair of WOT accelerations gave repeatable and satisfactory ratings of driveability with no surge, stumble, or stretchy operation. At no time were any detonation or fuel quality engine deficiencies noted even though this vehicle ran well up in the highly loaded engine condition most of the time.

Another decel to stop from 30 mph was followed by a PT in second through third to 20 instead of 25, mph. After upshift to fourth, another WOT accel was made. This accel is made uphill and the vehicle was only able to reach 25 instead of the nominal 35 mph of the procedure. The driveability quality was found satisfactory as with previous PT and WOT accels. A PT decel from 25 mph failed to produce backfires or other abnormal exhaust noise for either engine.

The last series involved a WOT accel from second to third gear from 0 to 20 mph uphill followed by a PT decel in third, from about 2800 rpm. This higher speed operation gave satisfactory driveability. The following 30 second idle was steady at 800 rpm for Engine 6-0P and 750 rpm for Engine 6-1 and idle quality found to be satisfactory for both engines.

The course was then driven the second or repeat time with all driveability evaluations marked satisfactory. The general behavior of the vehicle was identical to the first time around and no improvement or deterioration in vehicle driving quality was apparent. The final 30 second idle was found to give a smooth 800 rpm for Engine 6-0P and 760 rpm for Engine 6-1. The idle specification is 750 rpm ± 50 rpm.

In summary of the cold start driveaway tests, both engine configurations responded under loaded vehicle conditions equally satisfactorily. This vehicle, the highest weight to apparent power unit evaluated, required adjustment of the maximum course speeds to 5 miles per hour below the nominally specified speeds. This revision, one allowed for in the procedure, did not prevent or jeopardize the use of the driveaway course. Apparently, the control configuration did not noticeably influence the vehicle's driveability as evaluated relative to the baseline version of the engine.

b. Warm Driveability

Once the vehicle was thoroughly warmed up, a series of level road load manifold vacuum readings were taken both ways over a level course. The results are shown as follows for the vehicle powered by Engine 6-0P and 6-1.

Speed mph	Engine rpm	Trans Gear	Rear Axle	Manifold Vacuum, in. Hg 6-0P	6-1
20	2200	3	Hi	15.4	15
30	1850	4	Hi	10.6	9.9
40	2450	4	Hi	7.9	7.6
50	2600	5	Hi	5.3	4.6

The tractor-trailer rig was unable to operate over the level course at 55 mph or 60 mph in a repeatable manner because of the apparent power to weight. The trend was, at 40 mph, for the road load vacuum to be lower with Engine 6-1, a fairly common result with other controlled engines. No EGR was used on this engine but a richer mixture and the use of the air pump probably were the major reasons. The catalysts, mounted in tandem, imposed a higher backpressure on the engine than the standard muffler and this also affected level road load and general performance some, especially at high speed and power. The driveability under cruise conditions was rated satisfactory for both engines.

As with the cold start driveaway procedure, the maximum speeds of the warm driveability procedure accelerations were reduced by 5 mph from their nominal specification.

The WOT accels from 25 to 35 mph, in 4th with either rapid or slow opening of the throttle, resulted in satisfactory operation. Normally three part throttle accels from 25 to 35 are made at a nominal 14, 10 and 6 in. Hg. The 14 inch intake vacuum failed to produce enough power to noticeably accelerate the vehicle and therefore was not evaluated. The other two PT accels were satisfactorily operated with no adverse driveability quality noted.

Several "crowd" type accels were made with no apparent effect of the rate of "crowd" or throttle movement insofar as stumble, hesitation or stretchy operation. The vehicle and engine never exhibited any of the driveability deficiencies sometimes found with the other vehicles. It is not particularly surprising that the engine did not exhibit the stretchy-lean operation or even the hesitation that many times follows from application of EGR and other measures. The control configuration is intentionally fuel rich to make enough CO to make the reduction catalyst work.

All the decels, with either engine, from any vehicle or engine speed and in any gear resulted in no abnormal noise, backfiring, popping, stalls, etc. The reaction under a variety of road-like decelerations from various previous conditions was always the same and quite similar to that found during the cold start testing.

After several WOT accels, the engine was allowed to idle 30 seconds and then was shut off. Engine 6-0P idled smoothly at 750 rpm and Engine 6-1 idled at 700 rpm. The idle quality was satisfactory. After engine ignition shut-off, the engine wanted to after-run. This occurred with both engine configurations. After the 15 minute soak period, the engine restarted easily and idled with a T roughness at 500 rpm (Engine 6-0P) and 450 rpm (Engine 6-1). The reason for the lower speed idle was the air compressor operation to rebuild the engine air brake supply which leaked down during the engine off period. The engine was then turned off again with some after-run noted for both engines.

In summary of the warm driveability phase of the testing, both engines operated satisfactorily. As in the cold start phase, no detonation or fuel deficiency was noted and neither engine resulted in any noticeable stumble, hesitation, surge or stretchiness. Both engines seemed to operate properly but controlled Engine 6-1 seemed to have less power and performance than 6-0P Engine. Operation at CT and PT decel was judged identical and satisfactory without abnormal noise such as popping or backfiring.

c. Vehicle Performance

The final portion of each driveability series was a series of accelerations from 0-20, 0-40, and 0 to 50 mph on level road at WOT. The 0-50 mph accel was substituted for the 0-60 mph accel since the vehicle could not readily accelerate to a speed greater than 50 mph. The times and distances required to reach 20, 40 and 50 mph from rest and the 20 to 44 mph accel are listed below.

Engine	Configuration		Accelerations, mph			
			0-20	0-40	0-50	20-44
6-0P	"Uncontrolled"	Time, sec	15.0	53.5	116.6	51.1
		Dist, miles	0.052	0.400	1.185	0.498
6-1	"Controlled"	Time, sec	14.9	54	131.4	56.4
	R-Cat, O-Cat, Air	Dist, miles	0.053	0.404	1.314	0.547

The preceding indicates Engine 6-1, the controlled configuration, to have poorer accel performance than the uncontrolled Engine 6-0P. The difference increased as accel top speed increased and was most pronounced at the 0-50 mph and 20-44 mph runs. These differences were mentioned earlier as being probably attributed to the richer mixture, the use of an air pump system and the imposition of higher exhaust backpressure than Engine 6-0P had due to the use of two pair of exhaust catalysts. Although the pressure drop across the oxidation catalyst is important, it is somewhat less than the pressure drop across the reduction catalyst.

To investigate some of this effect, a quick test was made on the road by unbolting at the Y splitter the exhaust system from the exhaust manifold outlet elbow so that only straight exhaust was achieved. The performance in terms of acceleration was noticeably improved. To learn more of the differences in engine exhaust backpressures, measurements were taken on the chassis dynamometer at various engine speeds and rear wheel loads. They are listed below for comparison purposes.

Vehicle mph	Engine rpm	Gear Position	Rear Wheel Power Out, Hp obs		Exhaust Backpressure inches water	
			6-0P	6-1	6-0P	6-1
50	2600	5th Hi	91	87	62	94
40	2100	5th Hi	61	53	33	47
30	1600	5th Hi	35	33.5	18	21
20	1100	5th Hi	19	16	5	8
40	2450	4th Hi	59	53	33	54
30	1850	4th Hi	34	33.5	15	32
20	1200	4th Hi	19	16	5	12

The reduction-oxidation catalyst exhaust system imposed roughly 50 percent more backpressure on Engine 6-1 than Engine 6-0P with the stock muffler and exhaust system. Though Engine 6-1 exhaust backpressures are considered excessive, it is reasonable to assume that a suitable exhaust system design would result in exhaust restrictions comparable to the stock muffler. It is important to remember that no optimization and application to a specific engine was performed. And, it is quite likely that with exhaust backpressure given as a design requirement, that the tandem reduction-oxidation catalyst could be suitably packaged to minimize any deleterious effect on power and performance.

No hesitation, lean-stretchy or surge was noted nor at any time was any fuel deficiency apparent through engine detonation, knock, ping, or rattle. If this or any other similar faults were with either engine, they would have been found during the gradeability test. The following are average times, distances and speeds attained.

Engine	Configuration	Distance Miles	Max Speed, mph	Ending Speed, mph	Time Required, Seconds
6-0P	"Uncontrolled"	1.076	47	30	113.9
6-1	"Controlled" R-Cat, O-Cat, Air	1.073	44.5	24.5	122.2

The replicate accels repeated nicely with satisfactory driving qualities. As during the other acceleration tests, the performance of Engine 6-1 was unmistakably less than Engine 6-0P. Note the maximum speed and final speed attained over the 1.075 mile course and the somewhat longer time for Engine 6-1 to cover the distance.

The major conclusion of these tests was that Engine 6-1 performed more poorly than did Engine 6-0P probably due to the combined effect of increased exhaust backpressure (due to the tandem reduction and oxidation catalyst system), use of an air injection pump, and possibly due to the richer mixture needed for the reduction catalyst. Compared to other trucks tested in this project, the performance during acceleration and grade type tests was not outstanding. The time to accel to 40 or 50 mph and the lug-down of the vehicle on the grade test resulted in the lowest marks so far. Again, this reflects the low power to weight ratio of this particular rig relative to other units discussed in previous sections.

d. Catalyst Temperatures

The fourth portion of the road test procedure involved operating the catalytic muffler equipped truck for 5 minutes at 50 and 40 mph in 5th High while recording the catalyst outlet temperatures from each oxidation reactor on 10 second intervals. These temperatures are summarized on Table 47 and the max, min, and arithmetic average value indicated at the bottom. Operation at 60 mph was precluded since the vehicle would not reach 60 mph except down a very long hill. Occasionally the inlet to the oxidation catalyst gas temperatures were checked and found to be somewhat different, lower, from the outlet temperature. The maximum, minimum, and average of the before oxidation catalyst temperatures are at the bottom of Table 47. Normally the difference in inlet and outlet temperatures averaged about 400°F.

The average oxidation catalyst outlet and inlet temperatures were quite similar to that found in the stationary dynamometer operation. At no time during any of the road operation did the catalyst bed temperatures exceed 1600°F. The maximum continuous oxidation

TABLE 47. CHASSIS OPERATED ENGINE 6-1 OXIDATION CATALYST TEMPERATURES (5TH GEAR - HI)

Min:Sec	50 mph Cruise		40 mph Cruise	
	Left	Right	Left	Right
	After Oxidation Catalyst			
0:0	1600	1600	1450	1410
0:10	1570	1600	1450	1400
0:20	1500	1580	1480	1380
0:30	1580	1580	1500	1380
0:40	1560	1560	1450	1380
0:50	1540	1540	1480	1380
1:00	1540	1540	1490	1400
1:10	1530	1530	1480	1400
1:20	1520	1510	1450	1350
1:30	1510	1510	1440	1380
1:40	1500	1510	1470	1400
1:50	1500	1510	1460	1420
2:00	1540	1540	1430	1350
2:10	1520	1520	1380	1370
2:20	1510	1510	1380	1360
2:30	1500	1500	1380	1340
2:40	1520	1520	1300	1300
2:50	1500	1500	1300	1300
3:00	1500	1500	1260	1300
3:10	1520	1510	1240	1310
3:20	1560	1560	1200	1300
3:30	1560	1560	1200	1300
3:40	1540	1540	1200	1300
3:50	1540	1540	1200	1300
4:00	1520	1520	1200	1300
4:10	1500	1500	1200	1300
4:20	1520	1520	1200	1310
4:30	1520	1520	1200	1300
4:40	1540	1520	1200	1300
4:50	1500	1500	1160	1240
5:00	1500	1500	1180	1240
Avg	1528	1531	1336	1339
Max	1600	1600	1500	1410
Min	1500	1500	1160	1240
	Before Catalyst			
Avg	1205	1112	899	807
Max	1260	1200	900	890
Min	1120	1020	800	780

catalyst outlet temperature recommended by the manufacturer was 1600°F. Both catalysts temperatures were monitored during the cold and warm driveability as well as during the acceleration performance trials and this temperature was never exceeded. It should be noted that the inlet temperatures, "before", were measured in-between the reduction and oxidation catalysts and these also represent the reduction catalyst outlet temperatures.

2. Chassis Dynamometer

This sub-section contains the results of the nine-mode constant speed and the transient chassis dynamometer tests made with Engine 6.

a. Nine-Mode FTP

The plan of test was to perform replicate nine-mode FTP tests per the 1970-1973 test procedure immediately after engine installation for comparison with the final stationary baseline tests on the engine. The average results are summarized in Table 48 and show quite satisfactory correlation of the stationary to chassis engine operated emissions.

TABLE 48. ENGINE 6-0P STATIONARY AND CHASSIS NINE MODE FTP

			NDIR Instrument Results		
Dynamomter	Test	Run	HC, ppm Hex	CO, %	NO, ppm (Corr)
Stationary 8-24-73	79	2	89	0.563	1289
		5	103	0.693	1312
Average			96	0.628	1301
Chassis 9-19-73	1	1	132	0.638	1276
		3	141	0.570	1276
Average			137	0.604	1276

The above validates the removal and subsequent installation of Engine 6-0P in the vehicle without seriously modifying the emissions behavior of the parametric baseline engine.

b. 1975 Light Duty FTP

The inertia weight was 25,000 lbs and the level road load at 50 mph was 87 hp at the rear wheels for Engine 6-0P and 91 hp for Engine 6-1. All tests were made in high rear axle range, starting in second and upshifting to third at 15 mph and to fourth at 25 mph as specified. Upshift to fifth was changed to 45 instead of 40 mph as recommended by the driving schedule. Other shift patterns were investigated and this seemed as good or better than others and made the truck operate more as it might on the road.

Table 49 is a summary of the results by engine configuration.

TABLE 49. 1975 FTP TRANSIENT EMISSION RATES - ENGINE 6

Engine Code	Test Configuration	Test No.	Grams per Mile			Fuel Cons, mpg	
			HC	CO	NO_x	23 min	505 sec
6-0P	"Uncontrolled"	3	17.49	358.7	12.84	4.17	4.5
		4	16.66	347.4	12.39	4.13	4.5
	AVERAGE		17.08	353.1	12.62	4.15	4.5
6-1	"Controlled"	1	4.61	224.6	1.43	3.91	4.31
	R-Cat, O-Cat, Air	2	3.83	234.5	1.65	3.80	4.24
	AVERAGE		4.22	229.6	1.54	3.86	4.28
Percent Reductions, $\frac{\text{6-0P Minus 6-1}}{\text{6-0P}}$ X 100%			75	35	88	7	4.9

The average 5th wheel distance for the 23 minute run was 8.2 miles (8.24 miles Engine 6-0P, 8.16 miles Engine 6-1). The average distance for the 505 second run, after 10 minute soak, was 3.8 miles (3.85 miles Engine 6-0P, 3.71 miles Engine 6-1). These are somewhat higher than would be observed if the truck could have stopped as quickly as a 4000-lb car or even say a truck operating with 10,000-lb inertia. It was difficult to get the truck to stop using only the truck's air brakes. An additional 3000-lb of weight was added directly above the rear axle to help in traction. It would be possible to achieve better deceleration rates given a braking type dynamometer or one that had external braking capability. In the event the 23 minute LA-4 fuel consumption is desired, on a 7.5 mile basis, the mpg values can be multiplied by 0.915 (7.5/8.2). The 8.2 and 3.8 mile measured distances for Engine-vehicle 6 may be compared with Engine 1-vehicle 1, a much more powerful single drive tractor. Engine 1 had average distances of 8.12 miles (23 minute test, and 3.71 miles (505 sec test). The fuel consumption or mileage values given in Table 49 were based on fuel with 0.747 gms/cc (6.233 lbs/gal) density.

From the grams per mile values for the modified 1975 FTP, Engine 6-0P baseline HC and NO_x emissions were greatly reduced by the reduction-oxidation catalyst system which comprised Engine 6-1. A 75 percent reduction in HC, from average of 17.08 to 4.22 grams per mile, and an 88 percent reduction in NO_x, from 12.62 to 1.54 grams per mile, were obtained. CO was also reduced, by 35 percent, from 353 grams to 230 grams per mile.

It is thought that these rather high levels of CO and their fair reduction was a function of how the engine had to be operated on the transient LA-4 test schedule. Practically all the time, the accelerator pedal was either in the WOT, CT or idle position. The power to weight ratio of this vehicle required a substantial amount of WOT accel or CT decel and both modes, especially the WOT, produce the greatest quantities of CO. Copies of the computer reduced data for the four 1975 FTP tests made with this engine are included as Tables F-71 to F-74 of Appendix F. Please refer to these print-outs for more details on this test series.

D. Summary

In summary of this task, a series of stationary dynamometer tests of a parametric nature with Engine 6 were conducted to determine the extent to which HC, CO and NO_x could be reduced by available control technology. The parametric studies were successful in pointing to the "best-control" configuration which was found to be a combination of a pair of reduction and oxidation catalysts with air injection system and larger carburetor jets for the needed increase in CO for NO_x reduction. Table 50 is a summary listing of the pertinent results with this engine. The "best-control" configuration was found to yield greater than 90 percent reductions in HC, CO and NO_x by the nine-mode FTP and EPA and 23-mode experimental procedures. One exception was the 50 percent reduction in CO by the experimental 23-mode test.

The 75 percent and 88 percent reductions in HC and NO_x by the 1975 FTP compares fairly well with the stationary tests. The CO reduction of 35 percent agrees best with that obtained by the 23-mode test of 50 percent. Both the 1975 FTP and the 23-mode include WOT operation and this was found to be the point where more air was needed. Cycle weighted BSFC fuel consumption of 2 to 12 percent increase was found with the stationary tests whereas the 1975 FTP gave 5 to 7 percent losses in terms of mpg.

A series of chassis tests to determine cold start driveaway, warm driveability and acceleration performance were made with the engine in baseline and control equipped configurations. The major finding was that both engines responded under loaded vehicle conditions with equal driveability under cold start and warm conditions. This unit, with the highest weight to power, seemed to operate properly and the control configuration seemed to have less power and performance than the baseline engine. The reduction catalysts were one reason for this in that they imposed a substantial backpressure relative to the stock muffler. This difference in performance was confirmed during the acceleration tests.

TABLE 50. SUMMARY OF ENGINE 6 RESULTS

Stationary Results

Engine No.	Engine Description	HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lb/Bhp-Hr
		9-Mode FTP					
6-0P*	Parametric Baseline	5.1	6.9	41.7	10.2	9.8	0.91
6-1P	R&O Cat, Air, 64 Jets	0.7	0.3	3.1	0.4	0.2	0.93
		9-Mode EPA					
6-0P	Parametric Baseline	3.5	4.7	31.9	11.3	10.8	0.74
6-1P	R&O Cat, Air, 64 Jets	0.8	0.3	2.7	0.5	0.3	0.81
		23-Mode Exp.					
6-0P	Parametric Baseline	-	6.3	68.4	-	9.8	0.74
6-1P	R&O Cat, Air, 64 Jets	-	0.5	34.5	-	0.4	0.83

Chassis Results

9-Mode Chassis

Engine No.	Description		HC ppm Hex	CO %	NO(Corr) ppm
6-0P	Para. Base.	Stationary	96	0.63	1301
6-0P	Para. Base.	Chassis	137	0.60	1276

1975 LD FTP (LA-4 Mod)

Engine No.	Description	Grams/Mile HC	Grams/Mile CO	Grams/Mile NO_x	Fuel Econ., mpg 23 min	Fuel Econ., mpg 505 sec
6-0P	Parametric Baseline	17.1	353.1	12.6	4.2	4.5
6-1P	R&O Cat, Air, 64 Jets	4.2	229.6	1.5	3.9	4.3

Summary

Test Procedure	Percent Reductions HC(FID)	CO	NO_2 (CL)	Fuel Cons.
9 Mode FTP	96	93	98	(2)
9 Mode EPA	94	92	97	(9)
23 Mode Exp	92	50	96	(12)
1975 LD FTP	75	35	88	(7)

( ) means increase

*Engine 6-0P is 1973 California baseline less decel modulator.

IX. PARAMETRIC ENGINE 7 RESULTS (432 CID GASOLINE)

Engine 7 was the second of two engines selected for parametric study during the stationary dynamometer portion of the test. The approach was essentially identical to that followed for Engine 6 discussed in Section VIII.

A. Engine Configurations

Engine 7 was received in the 1973 California baseline configuration which included an air injection system with one air pump as a standard control item. The engine employed a distributor with centrifugal timing advance and called for an idle speed at 525 rpm and timing at 8° BTDC. The 1973 Standard baseline version of the engine, scheduled only for stationary baseline studies, was easily adapted from the 1973 California version by disconnecting the air injection system and by substitution of the carburetor and distributor. The 1973 Standard baseline carburetor employed one size leaner jets and provided a vacuum port for connection to the second distributor with vacuum timing advance. Idle speed and timing for the 1973 Standard baseline were the same as for the 1973 California baseline.

In this discussion of Engine 7, the 1973 California and 1973 Standard baseline engines are respectively designated 7-0 and 7-00. Engine 7-0, as used in most parametric configurations, is identified as 7-OP. Several parametric configurations employing both oxidation and reduction catalysts are assigned a 7-1P classification. Finally, the resultant "best combination" configuration employing oxidation and reduction catalysts is designated 7-1. The computer printouts for the resultant emission tests with the preceding engine configuration classifications are shown in Appendix G and include the various summaries of composite emissions.

An initial dynamometer variable speed and load break-in was not required with the 1973 California engine since it had already been performed by the engine manufacturer. A limited power curve obtained with the engine at this laboratory did show close agreement with data similarly obtained by the engine manufacturer. Initial FTP nine-mode composite emission levels were also very much in accord with those of the manufacturer using the same 7-0 engine configuration.

After about one-third of the stationary test plan for Engine 7 was completed, an engine malfunction forced a prolonged interruption of testing. For over two weeks, the engine was subjected to a wide variety of treatments in an attempt to restore it to its original condition. The problem was an unexplained shift in HC above normal baseline. The engine ran apparently over-rich at idle and over-lean during moderate to rapid accelerations. Another flow calibrated carburetor was obtained from the manufacturer with no improvement.

A detailed series of exhaust emission tests finally indicated the right side of the engine as the major area of a vacuum leak. Although the intake manifold and induction system had been leak checked completely a number of times as well as removed and regasketed, the manifold was again removed and placed in a fixture for leak check under pressure. No leaks were found, however, on re-installation, the engine again seemed to perform normally. Nothing was done to eliminate the leak since no actual leak was ever found. The engine did appear to operate more satisfactorily and subsequent baseline emissions runs demonstrated close to original values. Very little re-running of the stationary work completed was required. Although no further vacuum leak problems were encountered with the engine, a distinct difficulty was encountered with a faulty dump valve in the air injection system. On several runs towards the end of the study, the dump valve was found to be intermittently malfunctioning at CT operation where it is normally vacuum operated to divert the injected air to atmosphere. The dump valve was easily replaced with an electrically operated valve to enable completion of the stationary study with Engine 7.

1. Baseline

Table 51 lists in summary form the baseline results obtained by the several procedures.

a. Nine-Mode FTP

A number of FTP nine-mode runs with the 1973 California baseline engine were conducted during the course of the parametric study on Engine 7. Table 51 summarizes the FTP nine-mode results of the initial runs and subsequent "running" checks conducted to confirm performance repeatability of the 1973 California baseline engine.

Although some variation in emission levels and BSFC is noted between tests in Table 51, the variation was deemed reasonable. For purposes of comparison with other baseline and parametric configurations evaluated in this study, an average of the initial and "running" emission and BSFC values for Engine 7-OP was employed.

A comparison of the 1973 California baseline (Engine 7-0) and 1973 Standard baseline (Engine 7-00) show all emissions were reduced with the California engine. Except for HC-NDIR, reduced by 15 percent, emissions were reduced by more than 40 percent. It is interesting to note that ratio of HC-FID to HC-NDIR was significantly greater for the 1973 standard engine than for the 1973 California engine. This HC relationship was consistent in both of the nine-mode procedures.

The reduced emissions with Engine 7-0 in Table 2 were associated with a weighted BSFC penalty of 19 percent.

TABLE 51. BASELINE EMISSION TEST RESULTS - ENGINE 7

Engine		Test		Average Composite Emissions Grams/Bhp-Hr					Cycle BSFC Lb/Bhp-Hr
				HC		CO	NO_2		
No.	Configuration	No.	Date	NDIR	FID	NDIR	NDIR	CL	
				Nine-Mode FTP					
7-00	1973 Standard	116	10-15	4.0	7.1	66.7	14.5	13.5	0.64
7-0	1973 California	94	9-12	3.3	3.6	24.2	8.9	8.3	0.76
		102	9-19	2.7	3.8	28.0	8.3	8.0	0.74
		111	10-10	3.7	4.7	25.0	7.8	7.1	0.78
		114	10-11	4.0	4.8	27.6	7.4	6.7	0.77
		131	10-26	3.5	4.4	27.3	8.5	8.3	0.77
		AVERAGE		3.4	4.3	26.4	8.2	7.7	0.76
				Nine-Mode EPA					
7-00	1973 Standard	117	10-16	4.0	6.6	56.9	15.8	15.2	0.62
7-0	1973 California	96	9-13	3.4	3.0	24.6	8.1	7.6	0.69
				23-Mode Exp.					
7-00	1973 Standard	118	10-16	--	9.9	88.7	--	10.5	0.65
7-0	1973 California	100	9-19	--	5.2	22.2	--	6.2	0.67

b. Nine-Mode EPA

In Table 51, the 1973 California engine produced less emissions than the 1973 standard engine. Hydrocarbons by NDIR were reduced by 15 percent with 7-0. The remaining emissions with 7-0 showed reductions of not less than 49 percent. The emission decrease with Engine 7-0 were not accompanied with as severe a BSFC penalty by the EPA procedure as found with the FTP procedure.

Overall performance of the two baseline engines was similar in the tests by both nine-mode procedures.

c. EPA 23-Mode

As already shown by the FTP and EPA nine-mode baseline emission data in Table 51, Engine 7-0, by the 23-mode method, also showed lower emission levels when compared against Engine 7-00. All emissions with the California engine were reduced by 41 percent or greater. Carbon monoxide was reduced by 75 percent in the same engine (7-0). The increase in BSFC experienced with Engine 7-0 was only 3 percent using the 23-mode procedure and is the lowest cycle weighted BSFC penalty experienced with the three test methods.

2. Parametric Evaluation

Various parameters such as basic spark timing, carburetor jets, catalysts and EGR were evaluated singly and in combination using the nine-mode FTP as the basic test method. In all cases, the 1973 California baseline, (Engine 7-0), served as the reference engine and was used for comparison. The parametric configurations, designated 7-OP, include air injection except when stated otherwise.

a. Effect of Air Injection

Listed below in Table 52 for comparison are the composite emission (g/bhp-hr) and BSFC (lb/bhp-hr) results of Engine 7-0 with and without air injection by the nine-mode FTP method.

TABLE 52. EFFECT OF AIR INJECTION ON ENGINE 7-0 EMISSIONS, NINE-MODE FTP

Engine		Grams Per Bhp-Hr					
		HC		CO	NO$_2$		Cycle BSFC
No.	Control	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp-hr
7-0	Baseline	3.4	4.3	26.4	8.2	7.7	0.76
7-OP	w/o air injection	4.8	8.2	75.0	8.6	8.0	0.77

Composite CO appeared to be the emission most affected by air injection. Without air injection, CO was almost tripled. Hydrocarbons by FID almost doubled in value without air injection, while other emissions remained within the realm of repeatability exhibited by Engine 7-0 in Table 51. BSFC was virtually unaffected by air injection.

b. Effect of Decel Modulator

Since a decel modulator was not provided by the engine manufacturer for use with Engine 7, the decel modulator provided for use with a baseline engine was installed and used. Results of the single run conducted with the decel modulator are compared below to Engine 7-0.

TABLE 53. EFFECT OF THROTTLE MODULATOR ON ENGINE 7-0 EMISSIONS, NINE-MODE FTP

Engine		Grams Per Bhp-Hr					
		HC		CO	NO_2		Cycle, BSFC
No.	Control	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp-hr
7-0	Baseline	3.4	4.3	26.4	8.2	7.7	0.76
7-OP	Decel Mod	2.2	2.0	29.63	7.8	7.8	0.79

The effect of the decel modulator, as expected, was mostly manifested in the hydrocarbon emission levels. FID HC were substantially lowered while other emissions remained pretty much alike between the two engine configurations. A very slight increase in BSFC (4 percent) was indicated using Engine 7-0P with the decel modulator. Since the overall effect of the decel modulator on HC emissions was slight, and occurs only at CT, its use was not considered further in subsequent parametric engine configurations of Engine 7. Also, a deceleration device has shown no significant effect on emissions when used in conjunction with an oxidation catalyst.

c. Effect of Timing

The effect of basic engine spark timing on emissions and performance was evaluated with basic distributor timing set at 16°BTDC, 12° BTDC, 8° BTDC (standard timing), 4° BTDC, and TDC. The results are summarized in Figure 20 in terms of NDIR composite data in grams per bhp-hr. Cycle weighted BSFC, shown in Figure 20, are given on a lb per bhp-hr basis.

All emissions were reduced with retarded timing. A significant change in HC occurred between 16° and 12° BTDC, with HC reduced by 33 percent. From 12° BTDC to TDC, the HC reduction was less evident and overall amounted to 19 percent. Carbon monoxide showed a fairly constant decline from 16° BTDC to TDC. At TDC, the CO level was 54 percent lower than that at 16° BTDC. Nitrogen oxides also presented

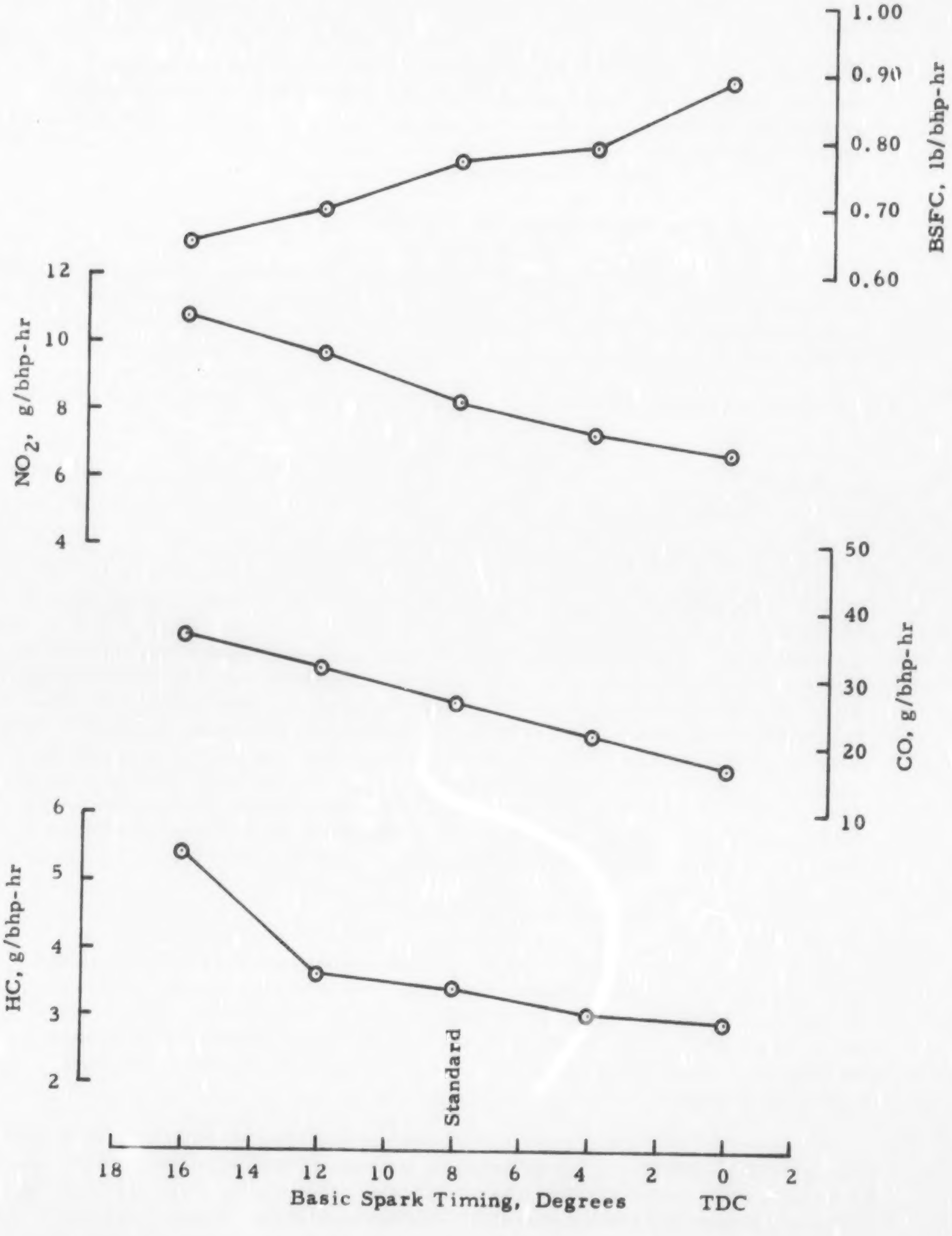

FIGURE 20. EFFECT OF SPARK TIMING ON EMISSIONS
ENGINE 7-OP, NINE-MODE FTP

values on a somewhat straight line decline, indicating an overall reduction of 37 percent from 16°BTDC to TDC.

BSFC increased with retarded timing. From the most advanced to most retarded timing conditions, cycle weighted BSFC increased 36 percent. The increased BSFC is reflected in the measurable loss of power summarized below at various manifold vacuums and indicated timings.

Engine 7-0P, Power (Bhp) at Various Basic Spark Timings

Spark Timing	Manifold Vacuum, in. Hg		
	3	10	16
16°BTDC	109	68	31
12°BTDC	107	64	28
8°BTDC (Std.)	104	60	22
4°BTDC	103	59	21
TDC	97	54	16

d. Effect of Carburetor Jet Size

In Figure 21, a summary plot of the results with various carburetor jet sizes is presented. The numerous jets used are identified by their bore size in thousands of an inch. The standard jet bore measured 0.066 inches. Jet size had a marked effect on emissions. Richer carburetion generally resulted in increased CO and decreased HC and NO_2. From the leanest to richest condition studied, CO increased 57 percent. In the same range, HC and NO_2 decreased by 44 and 24 percent, respectively. With standard jets, NO_2 showed a slight increase compared to the leanest jets (0.064 in.), so that NO_2 also appears to show a slight increase with leaner carburetion. It must be remembered that the standard jet emission data is an average value derived from several runs and that the range of NO_2 in these runs was 7.4 to 8.9 g/bhp-hr. The apparent deviations at standard jets in the HC and CO plots in Figure 21 also result from this averaging of the standard jet emission data.

A definite decrease of BSFC occurred as the carburetor jet size was increased. The BSFC measured 0.84 lbs/bhp-hr with the leanest jet and 0.71 lbs/bhp-hr with the richest jets. Therefore, cycle weighted BSFC with richest jets (0.068 in.) decreased by 15 percent when compared to the leanest jets (0.064 in.).

An increase of power at the 10 and 16 in. power modes was noticed with fuel enrichment with Engine 70P as shown in the following summary of bhp at 3, 10, and 16 in. power modes using the various jets discussed above:

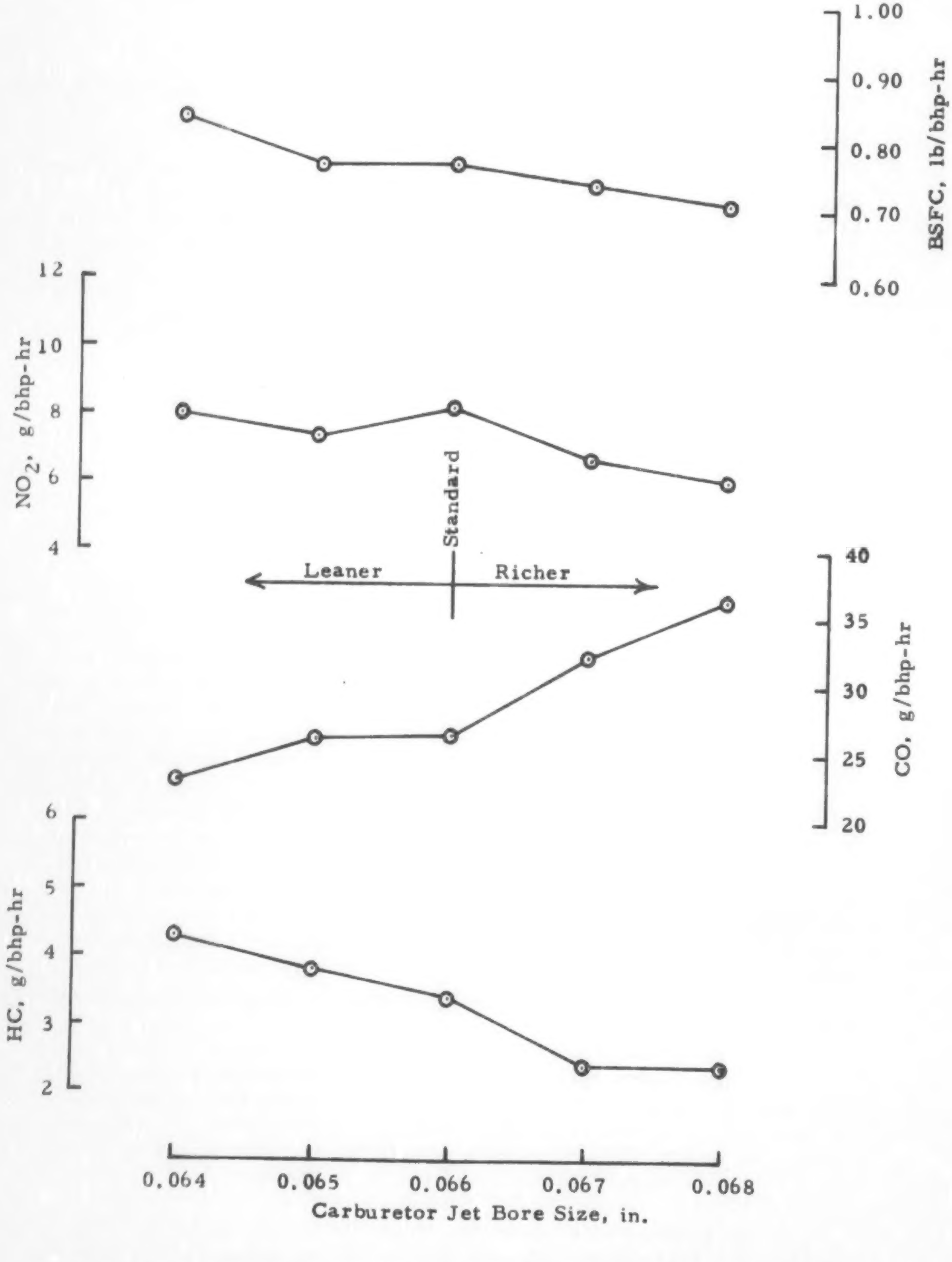

FIGURE 21. EFFECT OF CARBURETOR JET SIZE ON EMISSIONS ENGINE 7-OP, NINE-MODE FTP

Engine 7-0P, Power (Bhp) With Various Jet Sizes

Jet Size in.	Manifold Vacuum, in. Hg 3	10	16
0.064	103	50	13
0.065	104	58	22
0.066	104	60	22
0.067	104	61	24
0.068	104	63	25

In the lean to rich range represented above, the power (bhp) at 10 and 16 inch modes and at richest carburetion setting (0.068 in.) increased by 26 and 92 percent, respectively. Power at the 3 inch mode remained virtually constant throughout the jet study.

e. Effect of EGR

Since the basic design of Engine 7 did not provide for a conventional EGR installation in the intake manifold, a retrofit EGR system as prepared for Engine 6 was also used on Engine 7. The retrofit system allowed for one side of the EGR valve to be piped in to the carburetor spacer ports (a spacer with two ports was adapted to the carburetor) through a Y connection. The other side of the EGR was also Y-connected to the exhaust pipe sections close to the exhaust manifolds. The EGR vacuum signal was obtained from a small port drilled in the throttle plate section of the carburetor at a small distance above the closed throttle plate. The carburetor design in the throttle region did not easily allow for various experimental vacuum signal holes to be drilled and evaluated as was done in the carburetor for Engine 6. Nevertheless, the single vacuum signal port on this carburetor was adequate for the task. At manifold vacuums of 3, 10, 16, and 19 in. Hg, the port provided respective EGR vacuum signals of 2.7, 8, 2.8 and 0.5 in. Hg. The three higher EGR signals were sufficient to operate the selected EGR (EGR valve 4-1) as adjusted for initial opening at 1.5 in. Hg and for full opening at 7.4 in. Hg.

Figure 22 illustrates the results of the EGR study as conducted with various sizes of pintles. The plots show that the effects at the 5 and 10 percent pintle on emissions and BSFC were almost the same. Generally, these two pintle sizes established emission plateaus of HC (4.3 g/bhp-hr), CO (29 g/bhp-hr), and NO_2 (5.3 to 4.7 g/bhp-hr). These pintles also presented a BSFC plateau of 0.86 lb/bhp-hr. In comparison, the 15 percent pintle did not further improve NO_2 and also showed a marked increase in BSFC. Generally, the higher EGR rates decreased NO_2 and CO, and increased HC and BSFC. The BSFC increase from baseline using the 5 and 10 percent pintles was approximately

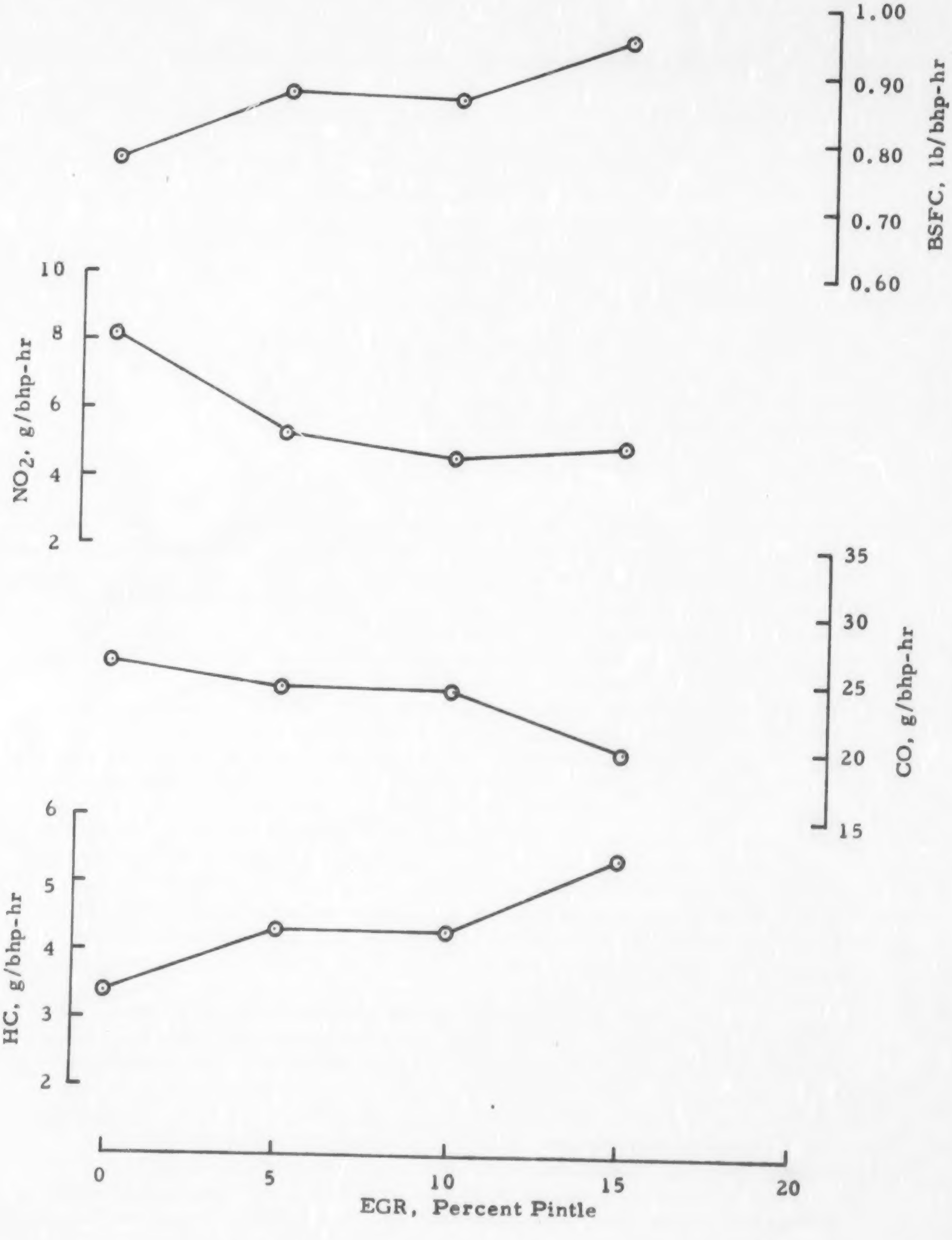

FIGURE 22. EFFECT OF EGR ON EMISSIONS
ENGINE 7-OP, NINE-MODE FTP

13 percent.

EGR rates of the various pintles discussed above were determined for different modes in the FTP nine-mode cycle. As was done in Engine 6, the EGR percent rates for the various pintles were obtained by comparing NO_2-CL emissions at the intake and exhaust manifolds. Sampling was accomplished only at the 3, 10, and 16 inch power modes. Sampling of the intake manifold gas stream was again accomplished by preparing several small ports at each intake manifold in regions close to the intake valves. The ports were then plumbed to a common line sampled by the NO_x analyzer. The EGR rates obtained in Test 112 (Test 112, Runs 1-3 data was used in Figure 22) were as follows:

Percent Pintle	Intake Manifold Vac., in. Hg	EGR Rate, Percent*
5	16	5
5	10	7
5	3	3
10	16	5
10	10	9
10	3	3
15	16	6
15	10	12
15	3	3

*Not corrected for water of combustion.

f. Effect of Oxidation Catalyst (Pellet Substrate)

On Engine 7, which was "V" type engine, one oxidation catalyst was connected as close as practical to the outlet of each of the exhaust manifolds. Exhaust from the oxidation catalysts was channeled to a Y which was in turn connected to a single exhaust to complete the overall exhaust system. The exhaust system allowed for later easy insertion of reduction catalysts. No muffler was used on the configurations employing oxidation catalysts.

Various configurations were considered and subsequently tried with oxidation catalysts. Air injection, timing, carburetor jets, and EGR were evaluated in some cases singularly or in combination with each other and the oxidation catalysts. EGR with the 10 percent pintle was considered the best compromise for use in this study. The results from this effort are summarized in Table 54 and include results of the the baseline engine for comparison.

TABLE 54. EMISSIONS SUMMARY OF EFFECT OF OXIDATION CATALYSTS AND VARIOUS CONTROL PARAMETERS - ENGINE 7

			Average Composite Emissions Grams/Bhp-Hr					Cycle
			HC		CO	NO$_2$		BSFC
Test	Run	Control Parameter	NDIR	FID	NDIR	NDIR	CI	Lb/Bhp-Hr
		Nine-Mode FTP						
115	1, 2	-	0.7	0.2	4.8	7.0	6.6	0.75
115	4	No Air	1.6	1.9	18.6	6.3	5.7	0.74
126	1, 2, 3	EGR 10	1.0	0.4	4.4	6.5	6.0	0.92
129	2	EGR 10, 12BTDC	1.3	0.5	8.3	5.7	5.4	0.82
129	3	EGR 10, 4BTDC	1.6	0.6	7.5	4.7	4.4	1.07
130	3	EGR 10, 12BTDC, 67 Jets	1.0	0.4	8.3	4.4	4.2	0.81
130	2	EGR 10, 8BTDC, 67 Jets	1.0	0.3	9.3	4.1	3.7	0.91
130	1	EGR 10, 4BTDC, 67 Jets	0.8	0.3	7.9	4.1	3.8	1.01
Engine 7-0 Baseline Average			3.4	4.3	26.4	8.2	7.7	0.76
		Nine-Mode EPA						
127	4	EGR 5	0.7	0.3	3.7	5.5	5.0	0.72
127	1, 2	EGR 10	0.7	0.3	3.3	4.6	4.6	0.73
127	3	EGR 15	1.0	0.4	2.5	4.5	4.2	0.75
Engine 7-0 Baseline			3.4	3.0	24.6	8.1	7.6	0.69
		23-Mode EPA						
128	1, 2	EGR 10	---	0.4	5.8	---	4.5	0.71
Engine 7-0 Baseline			---	5.2	22.2	---	6.2	0.67

The low limit of detectability of HC by NDIR is exceeded when oxidation catalysts are employed. Accordingly, the analysis of the data on Table 54 should be on the FID results.

Compared to the baseline, Engine 7-0, the oxidation catalysts alone or in combination with the indicated controls, lowered all emissions. Excluding the run (Test 115 - Run 4) without air injection, hydrocarbon, carbon monoxide, and nitrogen oxide levels showed average reductions of 91, 73, and 37 percent, respectively. Run 4 of Test 115, as would be expected without air injection, showed much less reduction of HC and CO emissions. Also, on the same run without air injection, the NO_2 emissions and cycle weighted BSFC remained almost unaffected.

It was rather difficult to discern in Table 54 a clear cut improvement of HC and CO due to EGR, timing, and carburetor jets. With EGR, the oxidation catalyst data showed a very slight increase of hydrocarbons and somewhat higher levels of carbon monoxide. Nitrogen oxides were lowered by an average of 30 percent using EGR. Retarded timing in Tests 129 and 130 generally served to reduce emissions but only very slightly.

Richer jets in Test 130, compared to standard jets in Test 129, reduced NO_2 on the average of 25 percent. The reduction of NO_2 with richer carburetion setting has been observed before when standard carburetion was near stoichiometric. However, based on the different settings of power modes with FTP and EPA nine-mode procedures, the richer air-fuel mixture effect on NO_2 has been observed using the FTP nine-mode test. For this reason, the EPA nine-mode runs with oxidation catalysts and EGR were made with standard jets.

The use of catalysts with EGR was accompanied by BSFC penalties. Compared to Engine 7-0 and catalyst alone, the largest BSFC increase was that observed with the most retarded timing and averaged 37 percent in Tests 129 and 130. Minimal differences in BSFC were noted between respective timings of Tests 129 and 130.

The emission results on the effect of catalysts with EGR as obtained with EPA nine-mode test are also listed on Table 54. HC, CO, and NO_2 were decreased with the oxidation catalysts and EGR. Generally, as in Test 127, a slight decrease of all emissions and a small increase of BSFC were noted with larger EGR rate.

With EGR valve 4-1 fitted with the 10 percent pintle, reductions of 90 (HC), 87 (CO), and 43 (NO_2) percent were obtained with respect to the baseline, Engine 7-0. BSFC was increased some six percent, relative to the baseline configuration.

When tested by the 23-mode experimental procedure, emissions were reduced by 92 (HC), 74 (CO), and 27 (NO_2) percent. BSFC increased, however, by six percent when the oxidation catalysts and EGR valve with 10 percent pintle were employed. The specific data for comparison is listed at the bottom of Table 54.

g. Effect of Reduction Catalyst

Since Engine 7 was scheduled to be run in a vehicle with the reduction catalysts, a practical approach was again taken in the optimization of the reduction catalysts. Unlike Engine 6, however, the optimization requirements were not as readily met with Engine 7.

Engine 7 was a V-6 engine and one reduction catalyst was closely connected to each of the two exhaust manifolds. The two exhausts remained separated until after the two oxidation catalysts. Provisions were made to supply a small amount of the air from the air pump just before the reduction catalysts and the bulk of the air just before the oxidation catalyst.

The manufacturer's recommended operating conditions for optimum performance of the reduction catalysts were as follows:

Catalyst Temperature	
Lowest for efficient operation	1150°F
Maximum sustained operation	1800°F
Maximum ever	2100°F

Exhaust CO Content	
Lowest for efficient operation	2.2% CO
Nominal best range	2.2% to 3.0% CO
Maximum	4.0% CO
Nominal best CO/O_2 Ratio	2 to 3

The optimization of the reduction catalysts on Engine 7 was carried out in the following way. On Engine 7, the power jet in the carburetor normally opened at around 8 inches Hg manifold vacuum resulting in an engine CO production profile which varied more than three CO percentage points from 19 to 3 inches Hg manifold vacuum. Therefore, it was necessary to obtain a best compromise by balancing both the main jets and the power jets in the carburetor. After compromise balancing of the systems, the following results were obtained at 2000 rpm:

Mode, inches Hg.	CO, %
19	1.8
16	2.8
10	3.0
3	2.5
WOT	2.0

Idle was set at a nominal 3 percent CO which resulted in a nominal 2 percent CO at cut-throttle. Catalyst temperatures consistently remained within the recommended range with the exception of the idle mode.

Using a hand operated valve to control the supply of air to the reduction catalysts the modes in the nine-mode FTP procedure were individually optimized. (The reason for supplying a small quantity of air to the reduction catalyst is to minimize the production of ammonia which subsequently is converted back to NO_x.) With careful adjustment of the control valve, NO_x values by CL below 50 ppm could be attained at all modes. The control valve was then replaced with a fixed orifice sized to provide the best overall reduction of NO_x. The resultant nominal modal values during actual nine-mode FTP runs with the engine fully warmed-up were:

Mode, inch Hg	NO_x, ppm
19	10
16	40
10	80
3	70

Additional reduction in NO_x would require fairly extensive carburetor modifications and/or a more complicated control system. This same orifice system also provided the optimum NO_2 reductions by the nine-mode EPA procedure.

Several optimization determinations were made to assure that the modally optimized results are essentially the best that can be practically attained. These determinations, a few of which are shown in Table 55, indicated that the modally optimized results were a "best-compromise" and that the two air pumps used initially were not necessary for either of the nine-mode procedures.

TABLE 55. ENGINE 7 REDUCTION AND OXIDATION CATALYST RESULTS, NINE-MODE FTP

		Emissions, Gms/Bhp-Hr			Cycle BSFC
Test	Condition	HC-FID	CO	NO_x-CL	Lb/Bhp-Hr
124	Optimized	0.55	4.3	0.45	0.75
120	2 Air Pumps	0.70	3.5	0.42	0.75
121-Run 1	Richer Power Valve	0.88	5.0	0.47	0.75
121-Run 2	Leaner Jets	0.53	0.8	5.26	0.71

As with Engine 6, this engine also had high exhaust backpressure resulting from the reduction catalysts. For example, the exhaust backpressure at 2300 rpm wide open throttle was approximately 7 inches of mercury with about 4 of the 7 directly attributed to the reduction catalysts.

During the 23-mode EPA runs (Test 125), one of the two PCV valves came loose resulting in a surge of air into the intake manifold and a 10 to 15 percent meltdown of the reduction catalyst. The container remained intact during this failure. Even after this catalyst failure, the NO_x emission reduction from the baseline configuration remained better than 80 percent based on a cursory evaluation. The catalysts were replaced with new units and after a few hours of running to activate the new units, the 23-mode EPA runs were resumed.

In summary, with the reduction catalysts, NO_2 composite reductions greater than 94 percent were obtained by all of the three test procedures. The reduction catalysts produced rather high exhaust backpressure which had an effect on power output of the engine. One set of reduction catalysts burned-out when a PCV valve came loose during a higher power output mode of the 23-mode EPA procedure.

3. "Best-Combination" Configuration

Table 56 is the summary of the FTP and EPA nine-mode, and EPA 23-mode results as compiled using Engine 7 with reduction catalysts and other essential control parameters. Engine 7, used with reduction and oxidation catalysts, 0.070 in. carburetor jets, and No. 60 power valve, was found to be the "best-combination" engine and has been identified early in this section as Engine 7-1. For each test procedure presented in Table 56, the corresponding 1973 California baseline data, Engine 7-0, as obtained with that procedure is included for comparison with the con-

Since the reduction catalyst-oxidation catalyst system with modified carburetor and air injection system resulted in the best overall reduction in emissions, it was considered the "best-combination" of controls. Accordingly, this system was selected for evaluation in the truck on the road and on the chassis dynamometer. The specific results, given on Table 56 as Run 120 and Run 124, for the nine-mode FTP, were essentailly identical. The only difference between the two was the use of one air pump instead of two in Run 124. The nine-mode EPA and 23-mode EPA results are with a single pump (Runs 123 and 125). The one pump air system was utilized in the truck evaluation because of the reduced complexity.

B. Chassis Operated Results

Engine 7 was installed in a 1971 conventional cab General Motors Corporation (GMC) Truck and Coach Division Model HM 7500 tractor.

TABLE 56. EMISSIONS SUMMARY FOR "BEST-COMBINATION" CONFIGURATION

			Average Composite Emissions Grams/Bhp-Hr					
			HC		CO	NO_2		Cycle BSFC
Test	Run	Control Parameter	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
		Nine-Mode FTP						
120	1, 2	R-Cat, O-Cat, 2 Air, 70 Jets, 60PV	1.1	0.7	3.5	0.8	0.4	0.75
121	1	R-Cat, O-Cat, 2 Air, 70 Jets, 56PV	1.1	0.9	6.0	0.9	0.5	0.75
121	2	R-Cat, O-Cat, 2 Air, 68 Jets, 68PV	0.9	0.5	0.8	5.7	5.3	0.71
124	1, 2, 3	R-Cat, O-Cat, 1 Air, 70 Jets, 60PV	0.8	0.6	4.3	0.8	0.5	0.75
Baseline (7-0)			3.4	4.3	26.4	8.2	7.7	0.76
		Nine-Mode EPA						
123	1, 2, 3	R-Cat, O-Cat, 1 Air, 70 Jets, 60PV	0.8	0.6	4.9	0.8	0.5	0.72
Baseline (7-0)			3.4	3.0	24.6	8.1	7.5	0.69
		23-Mode EPA						
125	1, 2, 3	R-Cat, O-Cat, 1 Air, 70 Jets, 60PV	---	0.7	12.2	---	0.4	0.71
Baseline (7-0)			---	5.2	22.2	---	6.2	0.67

This unit was a two-axle tractor used in city-suburban pick-up and delivery and had a 5-speed forward transmission and two-speed rear axle. The dual drive tires were 10.00-20 size. The odometer reading was 31,027 miles at the beginning and 31,192 miles at the end of the field studies.

In installing the controls on the engine, the reduction catalysts were located vertically and adjacent to the exhaust manifold flange and separated by only 2 inches of straight pipe. One reduction and one oxidation catalyst was installed in each bank of the "V" engine. The inlet of the oxidation catalyst was 7 ft from the outlet flange of the exhaust manifold. As usual, only the low lead test gasoline, used throughout this project, was employed. No exhaust muffler was employed.

1. Road

As with the other two tractors evaluated, Engines 1 and 6, this tractor was loaded on the basis of a combined gross weight of 45,000-lb using the same single axle test trailer used earlier. The empty weight was 13,900-lb and the test weight 29,450-lb. Also as with other trucks already tested in this project, 1st gear, or low-low, was not used and only the Hi rear axle position was used to simplify the testing procedures. All driving followed normal driving habit and shift pattern otherwise and no difficulty was encountered.

Weather conditions were quite stable during the field trials but were somewhat different between the test of controlled and uncontrolled engines. The weather was mild for the baseline tests while cooler, windy, weather prevailed during the controlled engine tests. Where wind could be a factor, the tests were repeated in both directions until satisfactory results were achieved. The difference in wind was the major difference between testing periods.

a. Cold Start Driveaway

All tests were made with a minimum overnight soak of 16 hours before start. Soak temperature was between 65-75 degrees F at night for Engine 7-0 and 55-65 degrees F for Engine 7-1. The truck-trailer rig was parked outdoors overnight and since the air brake tank would bleed-down overnight, a brief run at 1000-1500 rpm was needed to gain sufficient air pressure to permit operation of the truck. This is normal practice for most vehicles equipped with air brakes.

In general, this vehicle possessed performance between that noted for Engines 1 and 6 in that most, but not all, speeds could be achieved over the cold start driveability course. In general, Engine 7 performed equally well with either engine configuration over the course. It was able to reach all nominal speeds such as 25 and 35 listed in the procedure. Only during the uphill WOT accels from 25 mph was the truck unable to reach the anticipated 35 mph. This posed no problem, however, since the procedure has built-in flexibility to permit operation at lower or higher speeds.

Since both engines reacted so nearly the same throughout the cold start, both will be described together. The initial starts with both engines required 4 seconds and the manual choke was pulled out completely. The engine speed was then raised to 1000 rpm and held until the vehicle air brake pressure reached 75 psig. During this time, 30 seconds for Engine 7-0 and 45 seconds for Engine 7-1, the choke was moved in as required to maintain engine operation yet use no excess choke. This period of 1000 rpm operation replaced the 28 second fast idle cam step in the cold start and a clearing of the engine was then made. The engine faltered, stumbled, badly in both configurations due to either too much or too little choke plus the cold engine condition, but neither engine stalled.

The engine was then allowed to idle for 20 seconds and Engine 7-0 had satisfactory quality, 450 rpm, and Engine 7-1 had a T rough idle quality at 550 rpm. Incidentally, both engines exhibited a T-M idle roughness during the initial idle at 1000 rpm after start. When the vehicle was placed in 2nd gear, the idle speeds were both 500 rpm and a T rough quality, Engine 7-0, and satisfactory for Engine 7-1. At the end of this sequence of idle ratings, the choke was still at 1/2 out position.

The vehicle then pulled away from the curb and accelerated PT from 0 to 25 mph in 2nd to 4th gears. This critical first driving operation, like the initial start and idle, are probably the most critical of the entire test insofar as cold operation and resultant driveability are concerned. Engine 7-0 encountered a T stumble and Engine 7-1 had a T hesitation, neither mark of any significance and both happening during the initial accel in 2nd gear. The next condition, a WOT accel uphill from 25 mph in 4th gear, resulted in a 27 mph speed. Engine 7-0 had a T hesitation and Engine 7-1 was satisfactory. A quick decel uphill was then made with satisfactory rating given. At the mandatory stop, the choke was moved to the 1/3 position for both engines.

Another important PT accel from 0 to 25 mph produced a T hesitation and stumble for Engine 7-0 (the stumble coming in 2nd gear and the hesitation noted in the last part of the acceleration in 2nd and 3rd. Engine 7-1 performed this acceleration with a satisfactory rating. The fairly long CT decel downhill (1700 rpm) 4th gear was also rated as satisfactory. At this point, the choke was pushed in or in the "off" position. Satisfactory idle speed and quality was noted.

Next, a WOT accel in 2nd through 4th from 0 to 35 mph was performed followed by a downhill decel at average 2300 rpm to rest at CT. Again, satisfactory ratings were given both engines for these two steps. After a brief idle, another PT accel to 25 mph (2nd to 4th) was made with a T stumble, Engine 7-0 in 2nd gear, and satisfactory operation for 7-1. The CT decel in 4th gear produced one loud backfire, Engine 7-0, but was satisfactory with Engine 7-1.

Another WOT accel in 4th to 35 from 25 was then run with satisfactory performance for both engines. The CT decel back to 25 again produced one loud backfire, Engine 7-0, at the start of the decel. After a brief stop, another PT accel was made to 25 mph followed by a WOT in 4th to 30 mph, the maximum attainable on this mostly uphill section of the course. Both operations were satisfactory as was the PT decel from 30 mph for both engines. Another WOT accel in 2nd to 3rd to 30 mph (3500 rpm) was made followed by a PT decel to rest with satisfactory ratings given both engines. The idle period exhibited satisfactory quality and an engine speed of 600 rpm.

The repeat or second round of the cold start driveaway test resulted in even fewer driveability differences between Engines 7-0 and 7-1. It seemed that as the engine warmed up, the engine lacked even the T stumble, etc., noted the first time around. Only satisfactory driveability ratings were given both engines during the repeat test. Even the loud backfires, noted from Engine 7-0 at the start of the two CT decels, did not occur. The final idle quality was satisfactory and engine rpm of 620 for Engine 7-1 and 700 for Engine 7-0 recorded.

In summary of the cold start driveaway tests, both engine configurations responded under loaded vehicle conditions equally satisfactorily. Apparently, the control configuration did not noticeably influence the vehicle's driveability as evaluated using the baseline or "uncontrolled" version of the engine.

b. Warm Driveability

Once the vehicle was thoroughly warmed up, a series of level road load manifold vacuum readings were taken both ways over a level course. The results are shown as follows for the vehicle powered by Engine 7-0 and 7-1.

Speed mph	Engine rpm	Trans Gear	Rear Axle	Manifold Vacuum, in. Hg 7.0	7-1
20	2600	3	Hi	16.9	16.4
30	2150	4	Hi	14.0	13.8
40	2800	4	Hi	12.1	11.8
50	3000	5	Hi	8.7	8.8
55	3250	5	Hi	5.5	5.2

The tractor-trailer rig was unable to operate over the level course at 60 mph in a repeatable manner because of the apparent power to weight, so 55 mph cruise was substituted. The trend was, at all speeds and loads, for the road load vacuum to be about the same for both engines. No EGR was used on this engine and the richer mixture for the controlled engine apparently had little effect. The catalysts, mounted in tandem, imposed a higher backpressure on the engine than the standard muffler and this also affected level road load and general performance some, especially at high speed and power. The driveability under cruise conditions was rated satisfactory for both engines.

The WOT accels from 25 to 40 mph, in 4th with either rapid or slow opening of the throttle resulted in satisfactory operation. Normally three part throttle accels from 25 to 35 were made at a nominal 14, 10, and 6 inch Hg. Like the operation of Engine 6 in another tractor, the 14 inch intake vacuum failed to produce enough power to noticeably accelerate the vehicle and therefore was not evaluated. The other two PT accels were satisfactily operated with no adverse driveability quality noted.

Several "crowd" type accels were made with no apparent effect of the rate of "crowd" or throttle movement insofar as stumble, hesitation or stretchy operation. The vehicle and engine never exhibited any of the driveability deficiencies sometimes found with the other vehicles. It is not particularly surprising that the engine did not exhibit the stretchy-lean operation or even the hesitation that many times follows from application of EGR and other measures. With one notable exception for Engine 7-0, all the decels from any vehicle or engine speed and in any gear resulted in no abnormal noise, backfiring, popping, stalls, etc. Engine 7-0 had one loud backfire at the outset of the CT 40 to 25 mph. The reaction under a variety of road-like decelerations from various previous conditions was always the same and quite similar to that found during the cold start testing.

After several WOT accels, the engine was allowed to idle 30 seconds and then was shut off. Engine 7-0 idled smoothly at 600 rpm and 7-1 idled at 620 rpm. The idle quality was satisfactory. After engine ignition shut-off, both engine configurations wanted to after-run. After the 15 minute soak period, the engines restarted easily and idled with a T roughness at 520 rpm (Engine 7-1) and 510 rpm (Engine 7-0). The reason for the lower speed idle was the air compressor operation to rebuild the engine air brake supply which leaked down during the engine-off period. The engine was then turned off again with no after-run noted for either engine.

In summary of the warm driveability phase of the testing, both engines operated satisfactorily. As in the cold start phase, no detonation or fuel deficiency was noted and neither engine resulted in any noticeable stumble, hesitation, surge or stretchiness. Both engines seemed to operate properly. Operation at CT decel resulted in a loud backfire on several occasions with Engine 7-0 mainly when the engine was still cold and right after a WOT accel.

c. Vehicle Performance

The final portion of each driveability series was a series of accelerations from 0-20, 0-40, and 0 to 55 mph on level road at WOT. The 0-55 mph accel was substituted for the 0-60 mph accel since the vehicle could not readily accelerate to a speed greater than 55 mph. The times and distances required to reach 20, 40 and 55 mph from rest and the 20 to 50 mph accel are listed below.

Engine	Configuration		Accelerations, mph			
			0-20	0-40	0-55	20-50
7-0	"Uncontrolled"	Time, sec	12.1	41.7	80.1	49.2
	1973 Calif.	Dist, miles	0.044	0.305	0.845	0.526
7-1	"Controlled"	Time, sec	12.3	45.7	91.5	52.3
	R-Cat, O-Cat, Air	Dist, miles	0.044	0.337	0.983	0.563

The above indicates Engine 7-1, the controlled configuration, to have poorer accel performance than the uncontrolled Engine 7-0. The difference increased as accel top speed increased and was most pronounced in the 0-40, 0-55 mph and 20-50 mph runs. These differences were mentioned earlier as being probably attributed to the richer mixture and the imposition of higher exhaust backpressure than Engine 7-0 had due to the use of two pair of exhaust catalysts. Although the pressure drop across the oxidation catalyst is important, it is somewhat less than the pressure drop across the reduction catalyst.

To learn more of the differences in engine exhaust backpressures, measurements were taken on the chassis dynamometer at various engine speeds and rear wheel loads. They are listed on the next page for comparison purposes.

The reduction-catalyst exhaust system imposed roughly six times more backpressure on the engine than the parametric baseline Engine 7-0 with the stock muffler and exhaust system. Although the Engine 7-1 exhaust backpressures are considered excessive, it is reasonable to assume that a suitable exhaust system design would result in exhaust restrictions comparable to the stock muffler. It is important to remember that no optimization to a specific engine was performed.

Vehicle mph	Engine rpm	Gear Position	Rear Wheel Power Out, Hp obs 7-0	7-1	Exhaust Backpressure inches water 7-0	7-1
50	3000	5th Hi	65	65	14	98
40	2450	5th Hi	39	39	5	50
30	1850	5th Hi	25	25	1	22
20	1300	5th Hi	16	16	0	12
40	2800	4th Hi	39	39	8	30
30	2200	4th Hi	25	25	2	16
20	1500	4th Hi	16	16	0	0

And, it is quite likely that with exhaust backpressure given as a design requirement, that the tandem reduction-oxidation catalyst could be suitably packaged to minimize any deleterious effect on power and performance.

No hesitation, lean-stretchy or surge was noted nor at any time was any fuel deficiency apparent through engine detonation, knock, ping or rattle. If this or any other similar faults were with either engine, they would have been found during the gradeability test. The following are average times, distances and speeds attained.

Engine	Configuration	Distance Miles	Max Speed, mph	Ending Speed, mph	Time Required, Seconds
7-0	"Uncontrolled"	1.076	50	35.5	103.4
7-1	"Controlled", R-Cat, O-Cat, Air	1.076	48	30.5	110.7

The replicate accels repeated nicely with satisfactory driving qualities. As during the other acceleration tests, the performance of Engine 7-1 was less than Engine 7-0. Note the maximum speed and final speed attained over the 1.075 mile course and the somewhat longer time for Engine 7-1 to cover the distance.

The major conclusion of these tests was that Engine 7-1 performed more poorly than did Engine 7-0 probably due to the combined effect of increased exhaust backpressure (due to the tandem reduction and oxidation catalyst system) and possibly due to richer mixture needed for the reduction catalyst. Compared to truck 6, the other tractor of the same type engine, the performance during acceleration and grade type tests was definitely better. The time to accel to 40 or 50 mph and the lugdown of the vehicle on the grade test resulted in lower marks than the smaller trucks. Again, this reflects the lower power to weight ratio of this particular rig relative to the smaller units already discussed.

d. Catalyst Temperature

The fourth portion of the road test procedure involved operating the catalytic muffler equipped truck for 5 minutes at 55, 50, and 40 mph in 5th High while recording the catalyst outlet temperatures from each oxidation reactor on 10 second intervals. These temperatures are summarized on Table 57 and the max, min, and arithmetic average value indicated at the bottom. Operation at 60 mph was precluded since the vehicle would not reach 60 mph except down a long hill.

Occasionally the inlet to the oxidation catalyst gas temperatures were checked and found to be somewhat different from the outlet temperature. The maximum, minimum, and average of the before oxidation catalyst temperatures are at the bottom of Table 57. Normally the difference in inlet and outlet temperatures averaged about 100°F. The average oxidation catalyst outlet and inlet temperatures were quite similar to that found in the stationary dynamometer operation. At no time during any of the road operation did the catalyst bed temperatures exceed 1360°F. The maximum continuous oxidation catalyst outlet temperature recommended by the manufacturer was 1800°F. Both catalyst temperatures were monitored during the cold and warm driveability as well as during the acceleration performance trials and this temperature was never exceeded. It should be noted that the inlet temperatures, before, were measured in between the reduction and oxidation catalysts and these represent the reduction catalyst outlet temperatures.

2. Chassis Dynamometer

The nine-mode and 1975 FTP transient test results for Engine 7 in the truck are described in this subsection.

a. Nine-Mode FTP

The plan of test was, like all other chassis operated engines, to perform replicate nine-mode FTP tests per the 1970-1973 test procedure, immediately after engine installation for comparison with the final stationary baseline tests on the engine. The average results are summarized in Table 58 and show mostly satisfactory correlation of the stationary to chassis engine operated emissions. The HC correlation is termed satisfactory, chassis 12 percent lower than the stationary operated engine. Corrected NO was 16 percent higher by the chassis procedure which tends to complement the lower HC when chassis operated. CO was somewhat lower by the chassis test than

TABLE 57. CHASSIS OPERATED ENGINE 7-1
OXIDATION CATALYST TEMPERATURES (5TH GEAR - HI)

	55 mph Cruise		50 mph Cruise		40 mph Cruise	
Min:Sec	Left	Right	Left	Right	Left	Right
Oxidation Catalyst Bed Temperatures						
0:0	1300	1320	1180	1240	1180	1280
0:10	1300	1320	1140	1220	1130	1250
0:20	1300	1300	1130	1260	1140	1260
0:30	1300	1300	1130	1260	1120	1240
0:40	1280	1320	1130	1300	1120	1250
0:50	1260	1300	1200	1300	1120	1260
1:00	1280	1300	1130	1280	1140	1260
1:10	1260	1300	1160	1260	1160	1250
1:20	1280	1320	1140	1280	1140	1230
1:30	1260	1300	1200	1280	1120	1240
1:40	1260	1280	1140	1260	1120	1260
1:50	1270	1290	1140	1270	1180	1260
2:00	1260	1280	1130	1260	1180	1250
2:10	1250	1270	1140	1280	1130	1250
2:20	1260	1280	1100	1290	1140	1240
2:30	1260	1300	1110	1290	1120	1240
2:40	1270	1300	1140	1300	1140	1240
2:50	1280	1300	1140	1320	1100	1200
3:00	1280	1320	1200	1340	1120	1200
3:10	1320	1340	1250	1300	1100	1180
3:20	1340	1320	1240	1280	1100	1190
3:30	1290	1360	1160	1260	1080	1180
3:40	1240	1260	1140	1260	1070	1190
3:50	1250	1290	1140	1260	1050	1160
4:00	1260	1280	1120	1240	1050	1170
4:10	1270	1240	1100	1220	1050	1160
4:20	1260	1300	1100	1230	1060	1170
4:30	1280	1310	1100	1260	1060	1160
4:40	1260	1300	1120	1230	1050	1170
4:50	1280	1280	1140	1300	1060	1180
5:00	1270	1250	1160	1300	1070	1170
Avg	1275	1298	1147	1272	1110	1217
Max	1340	1360	1250	1340	1180	1280
Min	1240	1240	1100	1220	1050	1160
Before Oxidation Catalyst (After Reduction Catalyst)						
Avg	1321	1366	1339	1396	1208	1249
Max	1370	1420	1380	1430	1220	1260
Min	1280	1300	1300	1360	1200	1240

TABLE 58. ENGINE 7-0 STATIONARY AND CHASSIS NINE-MODE FTP

Dynamometer	Test	Run	NDIR Instrument Results HC, ppm Hex	CO, %	NO, ppm (Corr)
Stationary (10-26-73)	131	1	106	0.553	1096
		2	104	0.513	1098
		AVERAGE	105	0.533	1097
Chassis (11-1-73)		1	91	0.395	1331
		2	93	0.382	1214
		AVERAGE	92	0.389	1273

when operated stationary mounted and the main reason was the 3-inch mode. CO during this mode of operation was 50 to 65 percent that measured when the engine was stationary operated. The CT CO was also lower when the engine was operated in the chassis. The reason for differences in both of these modes is unknown.

The above, however, validates the removal and subsequent installation of Engine 7-0 in the vehicle without modifying the HC and NO emissions behavior of the parametric baseline engine. The CO behavior has been known to vary as much as ± 25 percent, from past experience and is not too surprising.

b. 1975 Light Duty FTP

The inertia weight was 25,000 lbs and the level road load at 50 mph was 65 hp at rear wheels for both Engines 7-0 and 7-1. All tests were made in high rear axle range, starting in second and upshifting to third at 15 mph and to fourth at 25 mph as specified. Upshift to fifth was changed to 45 instead of 40 mph as recommended by the driving schedule. Other shift patterns were investigated and this seemed as good or better than others and made the truck operate more as it might on the road.

Table 59 is a summary of the results by engine configuration. The average 5th wheel distance for the 23 minute run was 7.5 miles (7.444 miles Engine 7-0, 7.509 miles Engine 7-1). The average distance for the 505 second run, after 10 minute soak, was 3.49 miles (3.51 miles Engine 7-0, 3.47 miles Engine 7-1). These are somewhat lower than observed with truck 6. As with truck 6, it was most difficult to get the truck to stop using only the truck's air brakes. The trailer and several drums were used to add weight directly above the rear axle to help in traction. It would be possible to achieve better deceleration rates given a braking type dynamometer or one that had external braking capability. The fuel consumption or mileage values given in the table are based on fuel with 6.233 lbs per gallon density.

TABLE 59. 1975 FTP TRANSIENT EMISSION RATES - ENGINE 7

Engine Code	Test Configuration	Test No.	Grams per Mile HC	Grams per Mile CO	Grams per Mile NO_x	Fuel Cons, mpg 23 min	Fuel Cons, mpg 505 sec
7-0	"Uncontrolled"	3	13.52	179.0	10.02	3.99	4.45
	1973 Calif.	4	13.50	179.9	11.16	3.93	4.39
	AVERAGE		13.51	179.5	10.59	3.96	4.42
7-1	"Controlled"	1	2.55	42.8	0.25	3.99	4.37
	R-Cat, O-Cat, Air	2	2.80	53.1	0.38	3.90	4.36
	AVERAGE		2.68	48.0	0.32	3.95	4.37
Percent Reductions, $\frac{\text{7-0 Minus 7-1}}{\text{7-1}} \times 100\%$			80	73	97	0	(1)

From the grams per mile values for the modified 1975 FTP, Engine 7-0 baseline HC, CO, and NO_x emissions were greatly reduced by the reduction-oxidation catalyst system which comprised Engine 7-1. An 80 percent reduction in HC, from average of 13.51 to 2.68 grams per mile, and a 73 percent reduction in CO, from 179.5 to 48.0 grams per mile, were obtained. NO_x was also reduced, more than the other constituents, by 97 percent, from 10.59 to 0.32 grams per mile.

It is thought that the somewhat high levels of CO and their substantial reduction was a function of how the engine had to be operated on the transient LA-4 test schedule. Practically all the time, the accelerator pedal was either in the WOT, CT or idle position. The power to weight ratio of this vehicle required a substantial amount of WOT accel or CT decel and both modes, especially the WOT, produce the greatest quantities of CO. Copies of the computer reduced data for the four 1975 FTP tests made with this engine are included as Tables G-70 to G-73 of Appendix G. Please refer to these print-outs for more details on this test series.

During the last 505 second part of the last 1975 FTP run with the control-configuration, both reduction catalysts suffered a burn-out. Although the cause of the failures could not be ascertained, the failure appeared to be the result of excess O_2 in the feed gas to the reduction catalysts. The result was to destroy the catalyst and container in that a hole was burned-out of the catalyst entry section. Although some exhaust was lost and the catalyst was in a rapidly deteriorating state during the latter part of the test, the results were not appreciably different between the two runs as listed on Table 59.

C. Summary

In summary of this task, a series of stationary dynamometer tests of a parametric nature with Engine 7 were conducted to determine the extent to which HC, CO, and NO_x could be reduced by available control technology. The parametric studies were successful in pointing to the best control configuration which was found to be a combination of a pair of reduction and an oxidation catalysts with air injection system and larger carburetor jets for the needed increase in CO for NO_x reduction.

Table 60 is a summary of both the stationary and chassis emission test results. These are repeated from earlier tables to give an overall view of the achievements. At the bottom of Table 60 is a summary of this data in terms of a percent reduction taken as the baseline minus the control divided by baseline times 100 percent. The percent emission reductions were based on instrument methods of FID HC and NO_x by CL since they were consistent throughout the test plan.

The "best-control" configuration was found to yield 80 percent or greater reductions in HC, CO and NO_2 by the nine-mode FTP and EPA and 23-mode experimental procedures. One exception was the 45 percent reduction in CO by the experimental 23-mode test. Fuel consumption in terms of weighted BSFC ranged up to 6 percent increase depending on the test procedure.

Substantial, almost as great, reductions in HC and NO_x were found during the transient tests by the 1975 FTP light duty test. The 80, 73, and 97 percent reductions in HC, CO and NO_x by the 1975 FTP compares nicely with the stationary results. Cycle weighted BSFC of up to 6 percent increase was found with the stationary tests, whereas the 1975 FTP indicated no change in terms of mpg. Generally, the 1975 FTP trends were in the same direction and were mostly in agreement with the stationary test results.

A series of chassis tests to determine cold start driveaway, warm driveability and acceleration performance were made with the engine in baseline and control equipped configurations. The major finding was that both engines responded satisfactorily under loaded vehicle conditions with about equal driveability under cold start and warm conditions. This unit, with fairly high weight to power, seemed to operate properly but the control configuration seemed to have slightly less power and performance than the baseline engine. The reduction catalysts were one reason for this in that they imposed a substantial backpressure relative to the stock muffler. This difference in performance was confirmed during the acceleration tests.

TABLE 60. SUMMARY OF ENGINE 7 RESULTS

Stationary Results

Engine		Grams/Bhp-Hr					Cycle
		HC		CO	NO_2		BSFC
No.	Description	NDIR	FID	NDIR	NDIR	CL	Lb/Bhp-Hr
			9-Mode FTP				
7-0	1973 Calif.	3.4	4.3	26.4	8.2	7.7	0.76
7-1	R&O Cat, Air, 70 Jets, 60PV	0.8	0.5	4.3	0.8	0.4	0.75
			9-Mode EPA				
7-0	1973 Calif.	3.4	3.0	24.6	8.1	7.6	0.69
7-1	R&O Cat, Air, 70 Jets, 60PV	0.8	0.6	4.8	0.8	0.5	0.72
			23-Mode Exp.				
7-0	1973 Calif.	-	5.2	22.2	-	6.2	0.67
7-1	R&O Cat, Air, 70 Jets, 60PV	-	0.7	12.2	-	0.4	0.71

Chassis Results

9 Mode Chassis

Engine No.	Description	HC ppm Hex.	CO %	NO (Corr.) ppm
7-0	1973 Cal. Stationary	105	0.53	1097
	Chassis	92	0.39	1273

1975 LD FTP (LA-4 Mod)

Engine		grams/mile			Fuel Econ, mpg	
No.	Description	HC	CO	NO_x	23 min	505 sec
7-0	1973 Cal.	13.51	179.5	10.59	3.96	4.42
7-1	R&O Cat, Air, 70 Jets, 60PV	2.68	48.0	0.32	3.95	4.37

Summary

Test	Percent Reductions			
Procedure	HC(FID)	CO	NO_x(CL)	Fuel Cons.
9 Mode FTP	88	84	95	1
9 Mode EPA	80	80	93	(4)
23 Mode Exp.	87	45	94	(6)
1975 LD FTP	80	73	97	(0)

( ) means increase.

X. BASELINE ENGINE RESULTS

Two gasoline engines, Engines 8 (501 CID) and 9 (440 CID), were subjected to replicate baseline runs by the nine-mode FTP, nine-mode EPA and 23-mode EPA procedures. The results of these stationary dynamometer studies are described in the following sub-sections first for Engine 8 and then Engine 9.

A. Engine 8 Results

The stationary dynamometer baseline test of Engine 8 was made in its 1973 Federal configuration. There were no changes between the 1972 and the 1973 Federal configurations and this engine was not offered for sale in California for 1973. The computer print-outs and respective summaries of composite emissions for Engine 8-0 are in Appendix H.

After the initial mounting of Engine 8-0 on the dynamometer, a 25-hour variable speed and load break-in run was made. The idle speed and timing of the engine was 550 rpm and 5° BTDC. Performance of the engine, checked by obtaining a limited power curve, indicated its operation was within specifications of its manufacturer.

A summary of results for Engine 8-0, obtained with the three procedures are listed in Table 61.

TABLE 61. SUMMARY OF BASELINE EMISSION RESULTS FOR ENGINE 8-0

Test Procedure	Composite Emissions, Gr/Bhp-hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC, lb/Bhp-Hr
FTP 9-mode	3.7	5.1	73.2	10.2	9.6	0.78
EPA 9-mode	2.7	3.9	52.0	10.1	9.9	0.67
EPA 23-mode	---	6.5	84.8	----	9.6	0.67

---

*Engine 8-0, 1973 Standard Configuration (same as 1972 Configuration)

CO by the EPA nine-mode was 29 percent lower than that of the FTP nine-mode, HC by NDIR was 27 percent lower and BSFC was 14 percent lower. The cycle weighted BSFC value of 0.67 was the same for the EPA nine-mode and 23-mode procedures.

For this engine, the manufacturers CO idle air setting of 1.5 to 3.5 percent with a 40 rpm idle speed droop alternative was adhered to. Both methods yielded the nominal 3 percent idle CO recorded during the nine-mode tests without loss of idle quality. Of some concern was the fairly high CO throughout the test, with the exception of the 10 inch mode where conditions apparently were more correct for improved combustion. In summary, the generally overall high CO levels (except 10 inch) resulted in the rather high CO levels obtained.

Much the same reasoning holds for the nine-mode EPA test with the major reason for a reduction in CO from 73.2 to 52 gr/Bhp-hr due mainly to lower CO in the 10 percent, 30 percent, and 60 percent of power modes. The EPA nine-mode 10 percent power point was run at 18 inches intake manifold vacuum, the 30 percent at 14.1 inches manifold vacuum, and the 60 percent point at 7.6 inches vacuum. The HC + NO_2 results of 13.9 by NDIR in the nine-mode FTP were below the 1973 California-1974 Federal limit. HC levels in the nine-mode EPA runs were lower than in the FTP runs but the NO_2 levels were essentially the same for the two nine-mode procedures. NO_2 values as measured by NDIR and CL was discussed earlier in this report.

The 23-mode tests, made with the experimental EPA method, cannot be directly compared with the nine-mode results. This particular engine produced about the same level of HC, CO, and NO_2 in the 23-mode as in the nine-mode FTP, an agreement seldom found and not to be expected given the differences in operating modes and weighting factors. One aspect of the EPA 23-mode test results with Engine 8-0 warrants additional comment. Referring to the EPA 23-mode computer print-outs for this engine as found in Appendix H, one finds an unusually low value (7912 to 8665 ppm) for the as-measured concentration of HC as obtained at mode 23 (CT at 2300 rpm). A review of emission data of mode 23 in other baseline engines similarly studied in this project indicated generally higher values of HC were obtained at mode 23.

For example, in the other engines surveyed, HC at mode 23 generally ran from approximately 20 to 40 percent lower than HC at mode 12 (also CT but at 1200 rpm). However, with Engine 8-0, the HC values at mode 23 using Engine 8-0 were approximately 80 percent lower than those of respective mode 12 values for the same engine. The HC values obtained at mode 23 with Engine 8-0 were confirmed by similarly low and repeatable HC values obtained on several reruns of mode 23 using Engine 8-0.

One possible explanation for the low HC at mode 23 with Engine 8-0 is that 2300 rpm is very close to the governed speed of 2600 rpm. Although only a feeling, the CT HC concentrations may decrease as engine speed approaches the governed speed. The 2300 rpm CT is very close to the 2600 rpm governed speed whereas 2300 rpm is substantially below 3500 rpm, the usual governed speed of HD V-8 gasoline engines. Engine 8-0 is the first engine with a moderately low governed speed, and this gross difference in CT HC at 1200 and 2300 rpm was of concern.

B. Engine 9 Results

This stationary dynamometer series of tests were made of Engine 9 in its 1973 Federal baseline configuration. For this engine, the 1973 California configuration is reportedly the same as the 1973 Federal. Herein, the 1973 Federal baseline engine is designated 9-0. The engine performance and emission levels were evaluated with the nine-mode FTP, nine-mode EPA, and 23-mode EPA procedures. The computer printouts and respective summaries of composite emission for Engine 9-0 are in Appendix I.

According to the manufacturer, Engine 9 had been used for emissions research and development and was received at this laboratory with prototype EGR and air injection systems. The 1973 Federal baseline engine configuration required removal of the EGR and air injection systems. Timing on Engine 9-0 was set to 7.5°BTDC at 700 idle rpm. The idle air mixture jets were adjusted for minimum CO yet with acceptable engine idle smoothness and quality. Although a maximum of 1 percent CO at idle was specified, this was not possible to achieve with acceptable idle quality. When installed on the dynamometer stand for its initial start-up, Engine 9-0 immediately ran excessively rough and noisy at idle. The noise emanating from the engine was characteristic of several sources, such as a dropped valve, cracked piston, broken rod bearing, etc. and the engine was immediately shut down.

Examination of the spark plugs in the engine after shutdown revealed five of the spark plug electrode gaps were either completely closed or partially closed from their correct gap setting. The ground electrodes (exterior) on the affected spark plugs appeared to have been literally pounded with an object. Several attempts to correct the rough and noisy idle characteristics of the engine with replacement spark plugs were not successful. After each attempt, several spark plug gaps were again found beaten closed. After a lengthly discussion with the manufacturer regarding the diagnosis made, including compression pressures, etc. on June 28, 1973, a decision was made to remove the heads for further engine examination.

Examination of the disassembled engine quickly revealed the difficulty. Two extraneous aluminum pellets, of irregular but mostly spherical shape and of approximate 1/4 inch diameter, were found in the engine. One pellet was located loose on top of one piston (cylinder No. 4), while the other pellet was lodged between the seating surfaces of an intake valve and its respective seat (cyclinder No. 2) thereby maintaining the valve in an open position. Close examination of the top surface of each piston indicated the probable earlier presence of such pellets in at least four other cylinders. It was clearly in four of the cylinders, that the light carbonaceous type coating on the pistons was peppered repeatedly. Apparently, during the initial runs of the engine, the pellets had also served to alter the plug gaps. It is surmised that at least four or more other pellets were initially present in the cylinders but were blown out in the exhaust gases prior to engine disassembly. The source of the pellets is unknown, but the pellets could have been easily introduced into the engine at the carburetor opening to the engine.

Since a thorough check did not indicate other damage to the engine besides that already discussed, a decision was made in agreement with the manufacturer's technical representative on July 3, 1973 to regrind all valves and seats and to reassemble the engine for testing. Manufacturer's recommended new head gaskets and spark plugs were used on the engine. Upon assembly, the engine performed satisfactorily. A power curve obtained with the engine substantiated the engine performance was to manufacturer's specifications.

A summary of results for Engine 9-0, is given in Table 62.

TABLE 62. SUMMARY OF BASELINE EMISSION RESULTS FOR ENGINE 9-0*

Test Procedure	HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC, lb/Bhp-hr
FTP 9-Mode	6.3	8.8	87.8	8.5	7.8	0.72
EPA 9-Mode	5.6	8.3	132.3	7.5	7.3	0.75
EPA 23-Mode	---	7.2	160.2	---	4.5	0.74

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*1973 Federal Standard Configuration (The 1973 California configuration is reportedly identical).

The HC and NO_2 emission levels by FTP nine-mode and EPA nine-mode were essentially equivalent. HC and NO_2 by NDIR were approximately 13 percent higher in the FTP nine-mode than in the EPA nine-mode.

With the CO emission, a marked difference in value was noted between the two nine-mode procedures. In this case, CO obtained in the EPA nine-mode was 51 percent higher than in the FTP nine-mode. The major cause for the difference in CO was the 90 percent power condition of the EPA nine-mode procedure which was run at 2.4 inch Hg manifold vacuum instead of the 3 inch vacuum condition for the nine-mode FTP. This means the throttle plate was closer to WOT, and the CO increases at a very rapid rate as the engine approaches WOT. To a lesser extent, CO in the 60 percent mode of the EPA procedure (7.5 inches of manifold vacuum) was higher than in the 10 inch mode of the FTP.

The nine-mode FTP results may be compared directly to the 1973

California and 1974 Federal limits of HC + NO_2 of 16 gr/Bhp-hr. Engine 9-0 average HC + NO_2 was 6.3 + 8.5 or 14.8 gr/Bhp-hr by the nine-mode FTP. CO for Engine 9-0 was 87.7 gr/Bhp-hr by the nine-mode FTP, and this is substantially in excess of the 1973 California-1974 Federal limit of 40 gr/Bhp-hr.

It has been our experience in the past that the CO is so power valve, carburetor, sensitive on the nine-mode procedure, principally at the 3-inch condition, that CO can easily be substantially over the current Federal limit of 1.5 percent or the 1974 limit of 40 grams. The engine operated well otherwise and had acceptable HC and NO_2 emissions, power and BSFC. From surveillance work on other engines and from other engines in this project, to exceed the CO limit is not new.

Several tests were made with Engine 9-0 by the experimental 23-mode test procedure, and the average results are also shown in Table 62. These results are not directly comparable to the nine-mode results or the Federal limits and are provided as requested to add to the baseline knowledge of gasoline HD engines operated by this enlarged speed and load test exercise. Cycle weighted BSFC appeared to have increased very slightly in the two EPA methods. The average weighted BSFC in the FTP nine-mode was 0.72 compared to 0.74 in the EPA nine-mode and 0.75 lb/bhp-hr in the EPA 23-mode test.

C. Summary

In summary, replicate stationary dynamometer emissions tests, using Federal and EPA test procedures, were conducted to determine baseline emission levels of engines to broaden the current data base. The emission rates, in grams per bhp-hour can be added to those achieved in previous programs, as well as the other engines tested as a part of this project.

XI. ANALYSIS OF CONTROL OUTSIDE THE TEST PROCEDURES

This item in the work plan was intended to analyze emissions data resulting from the use of control techniques employed in this program, to relate these data to normal transient driving conditions, and to distinguish and discuss those control techniques which may be used to "beat the cycle".

A. Introduction

The objective of this control technology assessment was to see what available hardware and systems could do to reduce emissions from heavy duty engines. The optimization must be determined on the basis of some test procedure, and in the case of the gasoline portion of this project, there were three engine exercises involved. In achieving reductions, based on one or more of the procedures, the control method used should meet certain other criteria. One is that it should not be easily modified or amenable to alteration. Another is it should work so as to meet the intent of the procedure. However, in the case of the simplistic engine exercise, there is a tendency to merely design for the six different modes of the gasoline FTP and to neglect the operation they were intended to represent. In a sense, the application of so-called "defeat devices" may appear attractive as a means to "beat the cycle".

"Defeat devices" began as a means of control over the engine and its emissions control package to prevent their destruction under highly abnormal operation. The engineer can extend the range of the preventative or cut-out device to include all ranges of ambient above say 90°F and below say 65°F. The Federal Emissions Test is between 68 and 86°F. When such cut-outs are employed, they may be seen as "defeat-devices" and not in keeping with the intent of the law. Other control systems have inherent design which deteriorates with time so that emission control diminishes while the engine performance stays the same or better. Such "fail-better" devices are difficult to find by analysis and sometimes require extensive testing.

The emissions control package optimized for the nine-mode test procedure could conceivably be made inoperable at any speed between idle and 1900 rpm and at any speed above 2100 rpm since only idle and 2000±100 rpm are speeds of operation. This would clearly be a violation of the intent of the law and to our knowledge has not been practiced to date by anyone. Almost as significant, however, has been the practice by a few of tailoring carburetion and power valve staging and their operation in terms of the specific mode settings in order to "meet the cycle". It is possible to essentially design around, for example, the 10 inch, or especially the 3-inch modes to meet the emission requirements of the nine-mode procedure. It remains to be seen whether this approach makes a commensurate reduction under the actual road operation which the test procedure was intended to represent.

The arguments then center around the fact that the heavy duty engine exercises may or may not represent actual road operation under transient conditions sufficiently so that any approach to meet the standards is valid and justifiable. While it is true that the test procedure should indeed be so realistic to permit any action to meet the standards, it is this point of realism that is so debatable. Within reason, the cycles can be construed as being realistic. For example, in the nine-mode FTP, the 3-inch mode was to be the power mode and represent all acceleration operation. As another example, the CT decel at 2000 rpm was to represent all decelerations.

B. Objective

The intent of this analysis was to single out any of the control techniques which might be ineffective or could be made ineffective outside of the operating modes and conditions of the test procedure. Both gasoline engines and the diesel engine from the dynamometer and driveability phases of this project were considered. In essence, any system that can be rendered inoperative in reducing emissions was of concern and can be categorized as:

1) Speed sensitive
2) Vacuum or load sensitive
3) Temperature sensitive
4) Deposit or wear sensitive
5) Vibration sensitive
6) Combination of above
7) Other

By sensitive is meant the ability to be controlled or modified in a manner that defeats the intent of the emissions control regulations. This analysis was a part time activity throughout the test work and included conversations with the engine and control equipment manufacturers.

C. Test Procedures

The nine-mode EPA procedure, which technically appears to be a more suitable procedure where exhaust dilution (currently by EGR) is used to reduce emissions, was not directly applicable to two of the engines evaluated. On Engine 2 in the controlled configuration, the 90 percent torque mode coincided with a critical fuel scheduling point in the carburetor, while with Engine 5 in the controlled configuration the 90 percent mode could not be run unless the EGR signal vacuum was dumped from the system reservoir. This does not mean that the EPA procedure is the wrong approach, but rather that the engines were designed around a different procedure, namely the FTP. Since the manifold vacuum for a given percent of maximum load changes as the EGR rate is increased (in some cases a significantly large amount) it is apparent that a procedure based on manifold vacuum does not apply to the real world situation when EGR is used.

It appears possible to decrease FTP composite emissions and yet not decrease actual emissions in actual vehicle usage (Please refer to Table B-1 in Appendix B where the controlled engine 2-2 produced a large reduction in CO by the nine-mode FTP, whereas this same engine produced an increase in CO by the nine-mode EPA and the 23-mode EPA procedures). This is an example of how sensitive the engine can be to the procedure used. It can be reasoned that if the nine-mode FTP reflected realistic use of the engine, then the substitution of one engine exercise for another should have little effect either modally or in the composite. On some engines, this is true and on some it is not the case. It depends on how the engine was optimized for its application.

The nine-mode FTP does not take into account the cold starts and the transients of field operation. Although the cold start and/or transients may not be very important in uncontrolled engines (this has been demonstrated in a previous project(5)), they can become significant with controlled engines. For example, until a catalyst or thermal reactor warms up to its minimum effective operating temperature, the exhaust comes through mostly unreacted.

The whole subject of realism of the engine exercises lacks any clear definition at the current time. Though the current test procedures are fairly straightforward and simple to conduct and have the great advantage of assisting the engineer in effecting control through the modal data, this inherent simplicity may be their undoing in the long run. The heavy duty engine has been given low priority relative to light duty and to establish transient test procedure of the type employed for light duty is considered to be an order of magnitude more difficult to do. Some efforts are currently in progress by CRC through the Air Pollution Research Advisory Committee (APRAC) to define driving patterns and habits of heavy duty vehicles.

If it can be shown that the current test procedures do, in fact, closely reflect engine operation in the field, then it might be appropriate to consider each mode representative of all operation within a range. For example, the 10 inch mode could represent 13 to 6.5, the 3 inch mode represent 6.5 to WOT and the 16 inch mode from 17.5 to 13. The 19-inch mode could represent the range of 20 (but not CT) down to say 17.5. The CT at 2000 rpm should represent CT at all speeds of engine operation from say 1000 rpm up.

These representative modal ranges could be used in any engine exercise with the requirement that the level of control at any mode be the mean of the values within the modal range. Some type of tightening up of the definition of what these modes are intended to represent may be justified. Another short term alternative may be to merely increase the number of test conditions significantly to say twenty-five or thirty and use several speeds and a number of other power points.

D. Deceleration Device (Decel Modulator)

The test results and operation of Engines 4-0 and 4-1 prompted some discussion of the deceleration device. The experience gained during tests of Engines 4-0 and 4-1 demonstrated the important impact of this device on the closed throttle 2000 rpm motoring mode hydrocarbon emissions. The throttle modulator is an on-off engine speed sensitive device which holds the throttle plate open a pre-determined amount whenever engine speed is above 1800 to 1850 rpm. The pre-determined throttle opening for Engine 4 was 1350 to 1400 rpm no load.

This amount of opening resulted in a significant reduction of HC from a nominal 2500 ppm to a nominal 100 ppm Hexane. The fuel rate was essentially doubled meaning that the air rate was likewise doubled so that a rough comparison would be 500 gr/hr versus 40 gr/hr or about 12:1. Since the nine-mode FTP (and EPA) closed throttle mode contributes about half of the cycle weighted HC, this reduction in HC has a profound overall effect of almost halving the HC of the non-throttle modulated engine. For example, Engines 4-00 and 4-0 (device used on 4-0) had FTP composite HC emissions of 6.3 to 4.3 gr/Bhp-hr, respectively, and practically all this improvement with Engine 4-0 was due to the throttle modulator.

The modulator, however, appears to have its drawbacks not all of which are indicated by the current FTP. Since it is a speed sensitive on-off device with a pre-determined opening, it does not in fact modulate in the sense of controlling over a wide range of conditions. The only time the system is operative is at engine speeds above 1800 to 1850 rpm but vehicles do not decel this way. Normally, decelerations continue to, say, 1000 rpm before declutching. The nine-mode FTP CT condition is intended to represent the transient type decel and the operation between application of power and the start of a definable deceleration, hence the quasi-constant speed deceleration.

By limiting the action of the control item to 1800 rpm and above, an entire segment of operation is deleted even though the test results look very favorable during the FTP. Of course, the simple throttle opening device cannot be used at too low an engine rpm since normal engine braking and vehicle driveability and safety would be impaired. As the cut in-out speed is lowered, the truck will become increasingly difficult to stop.

It is also interesting to note that at speeds above 2000 rpm, specifically 2300 rpm (one of the 23-mode test speeds), that the influence of the preset throttle opening diminished from that found at 2000 rpm. Thus, approximately 2:1 at 2300 rpm. The gm/hr of HC at 2300 rpm CT were about 460 with Engine 4-00 (without modulator) versus about 240 for Engine 4-0 (with modulator). Some reduction is still afforded but at much lower significance. The reason is the amount of opening is ficed, and as the air requirement of the engine increases due to higher rotating speed, the carburetor begins to act more as it did before the modulator was used. In other words, there is an optimum opening for every speed for minimum emissions of HC during CT; and apparently this item is optimized for a single speed, i.e., 2000 rpm ± 100 rpm.

During the laboratory studies, it was found that the throttle modulator system was quite sensitive and frequently went out of adjustment. In any mode of failure, i.e., if the speed sensor quit, or solenoid valve discontinued operation, the engine, from an operating standpoint, would fail same or better and the operator, or one making a visual inspection, would not necessarily notice it. In almost all cases of failure, the CT emission of HC at 2000 rpm (the set point) would increase and approach that of the non-throttle modulator equipped engine. Additionally, a vacuum hose of which there are three could deteriorate and fall off, making the modulator inoperative. Except for a small vacuum leak in the carburetor which would make the engine idle faster if the right hose fell off, this would not be readily apparent to the operator.

Misadjustment of the position of the modulator itself, i.e., the amount of throttle opening, could have two consequences. First, the vehicle would not stop easily because of too much opening, or second, it would not hold the throttle open enough making little or no effect to the operator. In summary, the throttle modulator in its present form is a device that is quite dependent on the testing cycle. This item is currently in use on some 1973 California certified engines.

E. Air Injection Systems

Two major items of concern were experienced with the current air injection systems; one being the apparent unreliability of the control components and the other being the insufficient air at engine loads above the 3-inch Hg mode in the nine-mode FTP.

In several of the baseline engines the HC composite emissions by the nine-mode FTP would increase unless the injected air was cut off at cut throttle (and in some cases the 19 in. Hg mode) and was on at all other modes. The system to accomplish this consisted of a vacuum operated switch and a diaphragm actuated dump valve. In two of the engines (Engines 3 and 7) on which this system was used, malfunction of the system occurred. In all cases the system failed-worse with respect to emissions without having a significant effect on the operation of the engine. Also, three vacuum lines are used and leakage in any of the three can result in malfunction of the system.

The nine-mode FTP does not require engine operation above 3 inches Hg of manifold vacuum, which nominally corresponds to about 90 percent of max torque at 2000 rpm. When the air pump is sized for this 3 inch Hg at 2000 rpm operating condition, there is often insufficient air available after the carburetor power valve cuts in at some power point above 3 inch Hg. This was most readily apparent in Engines 2, 5, and 6 where CO, when using a catalyst, is much higher in the 23-mode EPA than in the nine-mode FTP. Essentially all of the increase occurred at the 92 and 100 percent power modes in the 23-mode procedure.

The air pump itself is well proven and found quite reliable. The controls are of concern if the experience in this project is any indicator of field experience. Engines do operate at WOT and at vacuums above 3 inch value given in the nine-mode FTP. Here is an example of operation outside of the test procedure in which the pump size was found to be an apparent reason for higher emissions.

F. EGR Systems

The use of vacuum amplifiers-controllers-computers, etc., can be shown to be helpful in meeting the EGR requirements of a steady-state engine exercise. When an amplifier, for example the type used on Engine 5, was employed under transient conditions, the lag in EGR signal at the valve versus the vacuum signal in the engine intake manifold can be appreciable time-wise. Under normal acceleration rapidly through the gears, the EGR valve signal and opening did not necessarily coincide with EGR demand. This was particularly noted during field operation by watching the EGR signal pressure at the valve and the intake manifold vacuum pressure gauge. The EGR valve signal pressure had a definite time differential as well as a build-up and decay rate for a given change of the engine manifold pressure. This could have been the reason why Engine 5-showed less NO_x improvement during the transient 1975 LD FTP than in the engine exercises.

Design of the EGR valve pintle and seat mechanism has proven relatively trouble-free in operation. This valve, however, remains one of the simplest items for the driver or operator to render inoperative and in so doing, generally make the engine run better. It will, at least, make the engine run no worse. Simply pulling off the small vacuum hose that transmits the signal to the valve and plugging the small vacuum leak will make the system completely inoperative since the valves are of the normally closed variety. To inspect for this requires a "loaded" test or some means to relate signal to valve travel using an external vacuum source.

G. Reduction Catalysts

The protection of a hot reduction catalyst, located a few inches from the engine exhaust manifold, from an air rich condition is a formidable job. From experience, during this project, in which two pair of such catalysts were failed, it takes very little operation at off-design for the catalyst to be ruined. Although it is rare that a PCV valve of the type used in Engine 7 would vibrate out of its pipe-thread connection to the head, it was illustrative of what an air leak can do.

Most PCV systems are external of the engine and employ slip fits over the valve and below the carburetor of the rubber connecting hose. The hose can get hard or otherwise deteriorate and leak at the joints, develop a crack, or just fall off. As soon as the feed to the reduction catalyst has excess O_2 from any source, the hot catalyst can oxidize.

Another way is to merely run out of gas or motor the engine with key-off in a downhill coast or some other slightly abnormal but possible operating condition. Some gasoline trucks are equipped with auxillary tanks and a valve to switch from say the saddle or main tank to a smaller, under or behind the seat, tank. Many times this is done before the main tank is dry but occasionally, the truck actually runs out of gas and is switched over while operating. If this happens while the catalyst is hot, there may be enough oxygen rich mixture pass through the reduction catalyst to cause partial failure.

Even testing of reduction catalysts is considered tricky in that the CVS must be cut-off just slightly before the engine actually stops after the 23-minute and 505-second operation on the 1975 FTP. Closed throttle motoring must be with fuel and ignition on, engine firing, if after a hot exhaust condition. To detect failure requires a loaded type inspection test or a visual inspection meaning probably partial disassembly.

H. General Discussion

Our experience in this and previous related projects has been that most control devices or exhaust emission hardware items either fail--same or better with regard to engine operation.

Take, for example, the use of current technology reduction catalysts. In this case, the carburetor is intentionally made to produce high levels of CO at most all operating conditions. This requires the use of larger amounts of air prior to the oxidation catalyst to permit oxidation of the CO to CO_2. In the event the air pump system discontinues operation, due to any cause, the catalyst is unable to do its job with the result of many times higher CO than normal. The driver of the vehicle will probably not detect an air system malfunction and, short of periodic inspection of the pump output, a malfunction may not be detected during normal maintenance. In the dual catalyst systems the oxidation catalyst is also placed in a much more critical position in that it must accommodate a higher CO feed. If it deteriorates or otherwise loses efficiency, the result, in terms of CO and HC, may be much greater. The heat release from oxidizing these increased CO feeds becomes of concern on possible catalyst durability. One way to protect the catalyst should over-temperature conditions occur would be to divert the oxidizing air from the oxidation catalyst feed causing most of the CO to continue through the catalyst unconverted. Another would be to actually divert the exhaust, an equally undesirable control from a pollution reduction standpoint.

In any discussion of defeat devices, any bypasses, cut-outs or diverters pose serious questions since they fail worse relative to emissions but will likely never fail worse, from the point of vehicle performance and driveability. The driver may often not realize anything has occurred and even if he does, may not care since operation of the vehicle is not affected.

A major area of concern has been the general approach toward add-on devices, that in themselves must be considered a positive improvement relative to emissions. Most items, however, are external or at least the ones employed by the manufacturers and SwRI on this program have been external. They invariably use rubber hoses and vacuum systems which can be made to work but are quite susceptible to disconnection either on purpose, by accident or through deterioration. For example, most EGR valves, even for heavy duty, depend on rate control from a vacuum signal from a specially drilled port in the carburetor venturi located just above the throttle plate. The loss of signal for whatever reason results in no EGR and a better running engine. The hoses are easy to disconnect and are subject to deterioration especially in heavy duty engines. One approach could be to cause the valve to stay open if the signal is lost (i.e., a normally open valve) but this would probably require a vacuum inverter. Such a device consists normally of diaphragms and pivots to accomplish and is another item that could fail or be rendered inoperative by short circuiting. In the event visual inspection was unable to detect this, a periodic exhaust emission test would require loaded operation since NO_x is not produced nor is the control system operative at idle or near idle vacuums.

I. Summary

This study considered a number of occurrences that could deleteriously affect the emissions behavior of heavy duty engines outside of the specific test procedure. A number of examples were related from our experience on this and the previous project with regard to the test procedures, individual components and control systems. Operation of gasoline engines at off-design can result in higher emissions just as operation under conditions other than the prescribed FTP can result in higher emissions. Much of the findings regarding the effect of procedure point to a more inclusive and possibly transient driving procedure to become more realistic of road operation. Possibly truck emissions will someday become sufficiently important to justify the expenditures needed to develop a driving-type test. In the interim, it is suggested that the test modes of the nine-mode FTP be defined so that it is clear what they are intended to represent so that these modes are not just isolated operating conditions within the broad spectrum of engine-vehicle operation.

XII. ECONOMIC EVALUATION

A low level of effort was devoted toward determining the cost impact of the emission controls that were found to be effective in the control technology phase of this project. A review of the literature was made $^{(18-54)}$ and costs were evaluated for those emission controls applicable to diesel and to gasoline engines used in heavy duty vehicle (HDV) applications rated over 14,000 GVW.

Before beginning this phase of the project, a planning meeting was held which included representatives from the Environmental Protection Agency, Southwest Research Institute and an economic consulting firm. At this meeting it was recognized that many assumptions would be required in areas where there is very little reliable information. The decision reached was to document data sources and assumptions and continue with this phase of the project. This problem of obtaining reliable information was subsequently reported and/or discussed with the project officer for several specific cases.

It was determined that cost estimates would have to be made in a number of cases since the controls used were either non-production prototypes or laboratory fabricated hardware. The primary components in this category were the oxidation and the reduction converters. These converters have not been completely developed for HDV use but are the most significant to the economic impact of emission controls. Although some of the emission control hardware used in the program were closely related to designs familiar to light duty vehicle (LDV) production, there was no definite concensus on the cost of these devices.

It also became evident from the control technology assessment effort that a wide spread in data resulted from one manufacturer's engine to another and from one type of emission test cycle to another with respect to emissions reduction and fuel economy penalties with similar control systems. The most significant spread involved the fuel economy penalties and these penalties have a significant effect on cost impact. These data are summarized in Appendix K. The scope of this economic evaluation, however, required the use of data from relatively few engines and of retrofit type emission control hardware.

Both the original and revised drafts of this section of the final report discussed the findings of the study and pointed out the areas in which significant assumptions were required. After considerable discussion, it was decided to defer reporting on this portion of the project pending further study by the Environmental Protection Agency.

XIII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Some of the important findings during this project are summarized as follows. Where appropriate, conclusions and recommendations are presented.

1. Scope - This project investigated the reductions in exhaust emission levels attainable using various control techniques appropriate to gasoline and diesel engines used in vehicles over 14,000-lb GVW. A total of eight gasoline and one diesel engine were evaluated in the laboratory phase of the project. Of the eight gasoline engines, two were evaluated parametrically, resulting in an oxidation and reduction catalyst "best combination" configuration, four were evaluated in an EGR plus oxidation catalyst configuration, and two involved only baseline tests. The one diesel engine was evaluated in an EGR plus oxidation catalyst "best combination" configuration.

Evaluation of the gasoline "best combination" configurations included: three engine emissions test procedures using an engine dynamometer, a determination of vehicle driveability, and one vehicle emission test procedure using a chassis dynamometer. The diesel engine evaluation differed only in that two emission test procedures were used on the engine dynamometer. To investigate transient vehicle operation, emissions were measured by the 1975 Federal Procedure normally used for certification of cars and light trucks below 6,000 GVW.

The driveability evaluations, performed in appropriately sized trucks, included a cold start driveaway, warm driveability and acceleration performance using special procedures for large trucks. Consideration was given to emission control techniques which may not be effective outside the test procedure and to various economic aspects associated with the "best combinations" of emission controls.

2. Test Procedures - The nine-mode EPA procedure (modes based on a percent of maximum torque) with few exceptions produced composite emissions essentially identical to the composite emissions obtained with the nine-mode FTP (the procedure specified in the Federal Register). The nine-mode EPA procedure, however, could not be used without slight modification with two emission controlled engines at the 90 percent torque mode.

Relative to the nine-mode FTP emission values obtained with the baseline gasoline engines, the composite HC values obtained with a 23-mode procedure (similar to 13-mode diesel procedure) were higher and the NO_2 values were lower. The net result was that the HC + NO_2 values for the nine-mode and the 23-mode procedures were approximately equal. The Federal Register specifies the use of NDIR instruments for the certification testing of gasoline engines. NDIR instruments for the measurement of unburned hydrocarbons (HC) and nitric oxide (NO) do not appear suitable for measuring the low levels attained with catalytic devices. No significant problems were observed with the CL and FID instruments simultaneously used in this project. The applicability of these instruments for continuous measurement of raw exhaust has not been fully established. Relative to the emission values obtained with the NDIR instruments, the individual modal values of NO + NO_2 obtained with CL were approximately 50 ppm lower and the composite HC emissions obtained by FID were approximately 40 to 50 percent higher than their NDIR counterparts. No significant procedural or instrument problem areas were observed with the 13-mode emission certification test procedure for diesel engines.

3. Stationary Dynamometer Results - Relative to the 1972 and 1973 baseline gasoline engine results, the oxidation catalysts evaluated in this project reduced the nine-mode composite emissions of HC-FID and CO-NDIR an average of over 90 percent. For the group of engines tested, the reduction in composite NO_2 emissions and the increase in composite BSFC obtained using EGR, varied greatly. Overall average reduction of NO_2 with the EGR "best-combination" was approximately 45 percent in the nine-mode procedures with an overall average increase in composite BSFC of 23 percent with the nine-mode FTP and 12 percent with the nine-mode EPA. No definite relationship could be established between the reduction in composite NO_2 and the increase in composite BSFC. With the dual catalyst "best-combination" in two engines, the reduction in all nine-mode emissions was generally greater than 90 percent. The increase in composite BSFC, applicable only to the reduction catalyst, could not be directly determined from the data, but is estimated to be approximately 12 percent.

With the oxidation catalysts, tested during this project, the reduction in HC-FID using the 23-mode procedure was generally 90 percent or greater, but the reduction in CO varied from approximately 50 percent to nearly 90 percent depending on the engine. This large variation in CO resulted from the emission levels of the 92 percent and WOT modes of the procedure and appeared to be directly related to whether or not sufficient air was available to enable maximum oxidation of the HC and CO.

With the diesel engine evaluated in this project, the "best-combination" configuration (EGR, timing retard, and oxidation catalysts) reduced composite HC, CO, and NO_2 by 82, 87, and 44 percent, respectively, in the 13-mode FTP and increased composite BSFC by 4 percent. The results obtained with the 23-mode EPA procedure were not significantly different. Also, the "best-combination" smoke in the acceleration and lugging modes increased 10 percent and peak smoke increased two percent from baseline.

4. Driveability - Except for the two baseline engines, each engine was operated in a suitably sized truck to determine the potential loss in vehicle driveability as a result of the emission control system. These tests were performed first for the control equipped and then the baseline configuration to facilitate a direct comparison. The cold start driveaway and warm driveability procedures, specially prepared for this project, indicated that EGR was responsible for most of the difference in driveability. Not unlike cars, the most common difference would be the increase in noticeability of stretchy-lean type operation during part throttle accelerations. Application of catalysts had no noticeable effect on driveability. The use of air pumps and the excessive backpressure of the reduction catalysts did noticeably slow vehicle acceleration performance during the field trials. Application of the emission controls studied in this project failed to severely impair vehicle performance or driveability.

5. Chassis Dynamometer Results - Using the 1975 light duty FTP, HC was reduced by 80 percent, CO by 60 percent. BSFC was increased by 6 to 10 percent using mainly an oxidation catalyst, air pump system and EGR. Reduction in NO_2 with the EGR was approximately 40 percent and with the reduction catalyst was over 95 percent.

On the average, HC by the 1975 LD FTP was about 50 percent greater than NO_2 for gasoline engines. This may be contrasted with the average results of the nine-mode FTP for gasoline HD certification, where HC was about 50 percent of the NO_2. With the diesel engine, the "best-combination" configuration reduced HC, CO, and NO_2 by 82, 96, and 40 percent respectively, and increased fuel consumption between 3 and 4 percent. Unlike the results with the gasoline engines, the HC and NO_2 emission levels relative to each other were almost identical by both the 13-mode stationary test and the transient test.

Operation of the gasoline and one diesel powered trucks by the transient driving procedure used for light duty vehicles was possible although not termed very realistic. The car driving schedule is rather lively and rapid for a large, heavily loaded truck. To try and stay with the driving schedule, what appears to be an inordinate amount of WOT and CT operation is required. Perhaps this procedure would be better conducted if the elapsed time was increased from 23 to say 30 minutes. Aside from difficulty during various accels, the deceleration of a truck and its braking, using a single drive axle turning 25,000-lb inertia simulation was most difficult to accomplish.

6. Emission Controls - The primary emission control hardware investigated in the gasoline engine phase of this project included air injection, several EGR systems, two deceleration devices, two oxidation catalysts and a reduction catalyst. A cursory evaluation was also conducted on an emission control system which used reduction catalysts and thermal reaction. Air pumps and EGR systems have been used in

light duty applications and it appears that systems for heavy duty applications need differ need only in flow capacity. This project has established that catalysts can initially reduce emissions to very low levels in the various test procedures. It appears, however, that heavy duty vehicles in addition to requiring a larger size oxidation catalytic converter also may require a different catalyst material to reduce attrition. The applicability of reduction catalytic converters to heavy duty vehicle applications and their durability have not been established. The decelerator device holds promise for reducing HC, according to the test procedure, but loses some of this advantage when operated outside the test procedure. An emission control system using thermal reaction and catalytic reduction was cursorily evaluated on one engine.

7. Controls Outside the Test Procedure - From the relatively small number of engines tested in this project, it appears that heavy duty gasoline engines are, in some cases, currently being designed to meet the nine-mode FTP. It has been shown for most engines that a deviation from the operating modes in this procedure can significantly affect emissions. As an example, with several of the gasoline engines in this project, inclusion of a WOT mode (i.e. 23-mode EPA procedure) had a large effect on composite CO.

Most of the emission control devices fail-same or better from an engine operation standpoint. The vehicle operator often may not become aware (or may not be concerned if he does become aware) that a failure has occurred. Often, the failure can only be detected by a loaded emissions test. In this project a relatively high failure rate was experienced with air system controls and reduction catalysts.

Some emission control methods were effective only at the operating condition of the nine-mode FTP. This was exemplified by the deceleration throttle modulator device where significant composite HC reduction was obtained in the nine-mode FTP but negligible reduction was obtained in the 23-mode EPA procedure. These widely different results were due to the different operating speeds of the two procedures and the optimization of the decel device for a specific test procedure.

8. Economic Evaluation - A low level of effort was devoted toward determining the cost impact of the emission controls that were found to be effective in the control technology phase of this project. A review of the literature was made and costs were evaluated for those emission controls applicable to diesel and to gasoline engines used in heavy duty vehicle (HDV) applications rated over 14,000 GVW. However, many assumptions were required in areas where there is very little reliable information and in several cases cost estimates had to be made since the controls used were either non-production prototypes or laboratory fabricated hardware. It also became evident from the control technology assessment effort that a wide spread in data resulted from one manufacturer's engine

to another and from one type of emission test cycle to another with respect to emissions reduction and fuel economy penalties with similar control systems. The most significant spread involved the fuel economy penalties and these penalties have a significant effect on cost impact. After considerable discussion, it was decided to defer reporting on this portion of the project pending further study by the Environmental Protection Agency.

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APPENDIX A

TASK 1 - ENGINE 1

MASS EMISSIONS RESULTS BY:
13-MODE FTP AND
EXPERIMENTAL 23-MODE PROCEDURE

SMOKE EMISSIONS RESULTS BY:
1974 FTP SMOKE TEST

TRANSIENT MASS EMISSIONS BY:
1975 LIGHT DUTY FTP

TABLE A-1. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001
ENGINE: 1-D

DATE OF TEST: 5-23-73 TEST-1 RUN-1
BASELINE STD CONF LOW SAC INJ 16 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	3.5	.4	.03	7.89	7.92	.004
2	1700	8.8	2.8	.12	19.44	19.56	.006
3	1700	117.3	38.0	.27	19.52	19.79	.014
4	1700	236.3	76.5	.47	20.52	20.99	.023
5	1700	351.9	113.9	.61	19.71	20.32	.031
6	1700	472.7	153.0	.88	19.21	20.09	.046
7	600	3.5	.4	.02	7.99	8.01	.003
8	2800	400.9	213.7	1.37	29.09	30.46	.047
9	2800	297.6	158.7	1.02	28.96	29.98	.035
10	2800	203.1	108.3	.76	28.61	29.37	.027
11	2800	98.0	52.3	.51	28.70	29.21	.018
12	2800	12.3	6.5	.32	28.98	29.30	.011
13	600	3.5	.4	.03	7.87	7.90	.004

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	439	394	155	.03	113.48	205.07	132.65
2	536	513	96	.23	98.86	93.22	28.57
3	420	435	398	3.04	2.89	5.96	8.97
4	396	212	853	6.12	1.25	1.53	10.11
5	360	150	1229	9.11	.85	.70	9.97
6	158	826	1290	12.24	.27	2.85	7.38
7	412	395	155	.03	108.97	207.90	134.98
8	57	1689	1029	17.10	.11	6.33	6.39
9	108	525	881	12.69	.47	2.61	7.19
10	390	310	718	8.66	1.22	2.21	8.32
11	464	559	365	4.18	3.42	8.22	8.80
12	752	753	136	.52	99.51	88.82	26.86
13	448	356	111	.03	119.76	189.97	94.71

CYCLE COMPOSITE BSHC = 1.400 GRAM/BHP HR
BSCO+ = 9.699 GRAM/BHP HR
BSNO2++= 8.156 GRAM/BHP HR
BSHC + BSNO2++= 9.556 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-2. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001
ENGINE: 1-D

DATE OF TEST: 5-23-73 TEST-1 RUN-2
BASELINE STD CONF LOW SAC INJ 16 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	3.5	.4	.03	7.87	7.90	.004
2	1700	12.3	4.0	.13	18.80	18.93	.007
3	1700	115.5	37.4	.27	19.78	20.05	.014
4	1700	234.6	75.9	.43	19.27	19.70	.022
5	1700	355.4	115.0	.63	19.40	20.03	.033
6	1700	472.7	153.0	.87	18.80	19.67	.047
7	600	3.5	.4	.03	8.00	8.03	.004
8	2800	397.4	211.9	1.37	28.81	30.18	.047
9	2800	299.4	159.6	1.00	28.69	29.70	.035
10	2800	201.3	107.3	.74	28.69	29.43	.026
11	2800	101.5	54.1	.51	28.69	29.20	.018
12	2800	10.5	5.6	.32	28.48	28.80	.011
13	600	3.5	.4	.03	8.40	8.43	.004

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	448	451	97	.03	116.84	239.44	83.02
2	506	538	120	.32	31.88	67.57	29.81
3	424	462	364	2.99	3.00	6.51	8.55
4	332	239	829	6.07	1.19	1.63	9.29
5	388	178	1283	9.20	.89	.81	9.66
6	154	846	1081	12.24	.26	2.86	6.00
7	412	429	116	.03	109.22	226.80	100.39
8	82	1701	1083	16.95	.10	6.37	6.67
9	202	667	985	12.77	.60	3.26	7.92
10	302	351	767	8.59	1.09	2.53	9.08
11	448	588	390	4.33	3.15	8.35	9.09
12	780	810	156	.45	98.07	109.62	39.61
13	432	422	114	.03	120.83	233.79	103.55

CYCLE COMPOSITE BSHC = 1.396 GRAM/BHP HR
BSCO+ = 9.982 GRAM/BHP HR
BSNO2++= 8.202 GRAM/BHP HR
BSHC + BSNO2++= 9.598 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-3. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

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PROJECT: 11-3438-001        DATE OF TEST: 5-24-73  TEST-1  RUN-3
ENGINE: 1-0                 BASELINE STD CONF LOW SAC INJ 16 BTC TIMING
--------------------------------------------------------------------------  .  ------------------------------------------------------------------------
MODE  ENGINE  TORQUE  POWER   FUEL     AIR    EXHAUST  FUEL                     MODE   HC      CO+     NO++  WEIGHTED   BSHC      BSCO+     BSNO2++
      SPEED                   FLOW     FLOW    FLOW     AIR
       RPM    LB-FT    BHP   LB/MIN   LB/MIN  LB/MIN   RATIO                          PPM     PPM     PPM     BHP    G/HP HR   G/HP HR   G/HP HR
--------------------------------------------------------------------------  .  ------------------------------------------------------------------------
  1     600     1.8     .2     .02     7.70     7.72    .003                      1    906     925     106      .01   207.00    431.96    177.43
  2    1700     8.8    2.8     .14    18.68    18.82    .008                      2    588     592     126      .23    96.30     99.63     36.27
  3    1700   117.3   38.0     .27    18.62    18.89    .014                      3    410     379     302     3.04     2.69      4.96      8.22
  4    1700   236.3   76.5     .45    19.01    19.46    .024                      4    360     166     834     6.12     1.21      1.11      9.17
  5    1700   357.1  115.6     .63    18.62    19.25    .034                      5    434     103    1279     9.25      .95       .98      9.20
  6    1700   469.2  151.9     .88    18.27    19.15    .048                      6    166     802    1818    12.15      .28      2.92      6.63
  7     600     1.8     .2     .03     8.18     8.21    .004                      7    426     463     111      .01   230.93    800.27    196.55
  8    2800   397.4  211.9    1.37    27.29    28.66    .050                      8     36    1683     989    16.95      .06      5.99      5.78
  9    2800   297.6  158.7    1.02    27.47    28.49    .037                      9    204     731     880    12.69      .48      3.45      6.82
 10    2800   199.6  106.4     .72    27.56    28.28    .026                     10    340     356     671     8.51     1.19      2.49      7.70
 11    2800    98.0   52.3     .50    27.69    28.19    .018                     11    450     669     370     4.18     3.20      9.47      8.61
 12    2800     8.8    4.7     .32    27.29    27.61    .012                     12    756     772     153      .37    59.03    128.06     39.09
 13     600     3.5     .4     .03     8.18     8.21    .004                     13    490     404     108      .03   119.26    220.68     95.47
                                                                                CYCLE COMPOSITE    BSHC    =   1.361   GRAM/BHP HR
                                                                                                   BSCO+   =   4.790   GRAM/BHP HR
                                                                                                   BSNO2++=    7.659   GRAM/BHP HR
                                                                                           BSHC + BSNO2++=    9.020   GRAM/BHP HR

                                                                                 +  CONVERTED TO WET BASIS
                                                                                 ++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS
                                                                                    WATER PER LB. DRY AIR
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TABLE A-4. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

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PROJECT: 11-3438-001        DATE OF TEST: 5-25-73  TEST-2  RUN-1
ENGINE: 1-1                 CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING
--------------------------------------------------------------------------  .  ------------------------------------------------------------------------
MODE  ENGINE  TORQUE  POWER   FUEL     AIR    EXHAUST  FUEL                     MODE   HC      CO+     NO++  WEIGHTED   BSHC      BSCO+     BSNO2++
      SPEED                   FLOW     FLOW    FLOW     AIR
       RPM    LB-FT    BHP   LB/MIN   LB/MIN  LB/MIN   RATIO                          PPM     PPM     PPM     BHP    G/HP HR   G/HP HR   G/HP HR
--------------------------------------------------------------------------  .  ------------------------------------------------------------------------
  1     600     1.8     .2     .02     5.90     5.92    .004                      1    272     407     108      .01   106.37    316.74    138.03
  2    1700    14.0    4.5     .13    16.11    16.24    .008                      2    518     564     108      .36    24.50     53.20     15.86
  3    1700   117.3   38.0     .27    16.11    16.38    .017                      3     63      13     244     3.04      .36       .14      4.54
  4    1700   234.6   75.9     .43    16.12    16.55    .027                      4     31      43     362     6.07      .04       .24      3.40
  5    1700   353.6  114.5     .64    16.12    16.76    .040                      5     44      41     557     9.16      .04       .16      3.52
  6    1700   467.4  151.3     .89    18.84    19.73    .047                      6     11      36     483    12.10      .02       .12      5.54
  7     600     1.8     .2     .02     6.06     6.08    .004                      7    280     337      88      .01   112.45    264.08    115.71
  8    2800   392.1  209.1    1.38    28.74    30.12    .048                      8      5      62     843    16.73      .01       .24      5.25
  9    2800   292.4  155.9    1.05    23.36    24.41    .045                      9      5      46     438    12.47      .01       .19      2.97
 10    2800   196.1  104.5     .75    23.73    24.48    .032                     10     14      47     370     8.36      .04       .29      3.82
 11    2800   101.5   54.1     .52    23.36    23.88    .022                     11     36      53     278     9.33      .21       .61      5.29
 12    2800     7.0    3.7     .32    23.37    23.69    .014                     12     62      28     117      .30     5.19      4.71     31.47
 13     600     1.8     .2     .04     5.68     5.72    .007                     13    264     365     103      .01   101.58    274.30    126.84
                                                                                CYCLE COMPOSITE    BSHC    =    .259   GRAM/BHP HR
                                                                                                   BSCO+   =    .664   GRAM/BHP HR
                                                                                                   BSNO2++=    4.572   GRAM/BHP HR
                                                                                           BSHC + BSNO2++=    4.831   GRAM/BHP HR

                                                                                 +  CONVERTED TO WET BASIS
                                                                                 ++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS
                                                                                    WATER PER LB. DRY AIR
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TABLE A-5. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

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PROJECT: 11-3438-001          DATE OF TEST: 5-25-73  TEST-2  RUN-2
ENGINE: 1-                    CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING
```

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.03	6.69	6.72	.005
2	1700	10.5	3.4	.13	16.38	16.51	.008
3	1700	120.8	39.1	.29	17.11	17.40	.017
4	1700	232.8	75.4	.44	15.93	16.37	.028
5	1700	353.6	114.5	.64	15.93	16.57	.040
6	1700	463.9	150.2	.87	18.60	19.47	.047
7	600	1.8	.2	.25	5.62	5.87	.044
8	2800	388.6	207.2	1.37	27.97	29.34	.049
9	2800	295.9	157.7	1.06	23.50	24.56	.045
10	2800	197.8	105.5	.77	23.50	24.27	.033
11	2800	101.5	54.1	.52	23.50	24.02	.022
12	2800	7.0	3.7	.31	23.49	23.80	.013
13	600	1.8	.2	.03	5.87	5.90	.006

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	284	372	97	.01	126.02	329.12	141.03
2	468	467	91	.27	30.00	59.69	19.12
3	57	6	265	3.13	.33	.07	5.10
4	41	26	359	6.03	.12	.15	3.37
5	23	13	558	9.16	.04	.05	3.49
6	7	18	948	12.01	.01	.06	5.31
7	228	279	118	.01	88.33	215.19	150.20
8	4	62	871	16.58	.01	.23	5.33
9	3	50	448	12.62	.01	.20	3.01
10	12	51	377	8.44	.04	.31	3.75
11	25	53	261	4.33	.15	.61	5.00
12	54	54	124	.30	4.59	8.98	34.10
13	274	372	103	.01	106.76	288.57	131.54

```
CYCLE COMPOSITE     BSHC    =   .237   GRAM/BHP HR
                    BSCO+   =   .605   GRAM/BHP HR
                    BSNO2++=   4.664   GRAM/BHP HR
             BSHC + BSNO2++=   4.901   GRAM/BHP HR
```

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-6. ENGINE 1 13-MODE FTP GASEOUS EMISSIONS RESULTS

```
PROJECT: 11-3438-001          DATE OF TEST: 5-25-73  TEST-2  RUN-3
ENGINE: 1-1                   CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING
```

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.02	6.34	6.36	.004
2	1700	12.3	4.0	.12	15.57	15.69	.008
3	1700	117.3	38.0	.28	16.26	16.54	.017
4	1700	236.3	76.5	.44	16.26	16.70	.027
5	1700	357.1	115.6	.67	15.87	16.54	.042
6	1700	462.2	149.6	.88	18.93	19.81	.047
7	600	1.8	.2	.02	5.89	5.91	.004
8	2800	388.6	207.2	1.37	28.27	29.64	.048
9	2800	294.1	156.8	1.06	23.91	24.97	.044
10	2800	199.6	106.4	.76	23.41	24.17	.032
11	2800	99.8	53.2	.52	23.41	23.93	.022
12	2800	7.0	3.7	.31	23.33	23.64	.013
13	600	1.8	.2	.03	6.26	6.29	.005

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	279	367	99	.01	117.21	307.25	136.90
2	509	495	104	.32	26.32	51.50	17.79
3	64	24	277	3.04	.37	.28	5.21
4	43	28	393	6.12	.12	.16	3.70
5	23	33	565	9.25	.04	.12	3.49
6	7	29	915	11.97	.01	.10	5.24
7	228	331	124	.01	89.01	257.59	160.09
8	1	75	727	16.58	.00	.28	4.49
9	4	65	375	12.54	.01	.27	2.53
10	13	53	330	8.51	.04	.32	3.24
11	23	56	212	4.26	.14	.67	4.12
12	56	55	103	.30	4.68	9.08	28.23
13	227	307	80	.01	94.29	253.02	108.77

```
CYCLE COMPOSITE     BSHC    =   .237   GRAM/BHP HR
                    BSCO+   =   .666   GRAM/BHP HR
                    BSNO2++=   4.172   GRAM/BHP HR
             BSHC + BSNO2++=   4.408   GRAM/BHP HR
```

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-7. ENGINE I EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3448-001 DATE OF TEST: 5-23-73 TEST-1 RUN-1
ENGINE: 1-0 BASELINE STD CONF LOW SAC INJ 16 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	3.5	.4	.03	7.89	7.92	.004
2	1700	8.8	2.8	.12	19.44	19.56	.006
3	1700	42.0	13.6	.16	19.40	19.56	.008
4	1700	84.0	27.2	.22	19.86	20.08	.011
5	1700	117.3	38.0	.27	19.52	19.79	.014
6	1700	236.3	76.5	.47	20.52	20.99	.023
7	1700	351.9	113.9	.61	19.71	20.32	.031
8	1700	388.6	125.8	.72	20.04	20.76	.036
9	1700	434.2	140.5	.77	19.34	20.12	.040
10	1700	472.7	153.0	.88	19.21	20.09	.046
11	600	3.5	.4	.02	7.99	8.01	.003
12	1700	0.0	0.0	0.00	19.04	19.04	0.000
13	2800	400.9	213.7	1.37	29.09	30.46	.047
14	2800	371.1	197.8	1.23	28.97	30.20	.043
15	2800	330.9	176.4	1.08	28.58	29.66	.038
16	2800	297.6	158.7	1.02	28.96	29.98	.035
17	2800	203.1	108.3	.76	28.61	29.37	.027
18	2800	98.0	52.3	.51	28.70	29.21	.018
19	2800	71.8	38.3	.44	28.59	29.03	.015
20	2800	31.5	16.8	.36	28.59	28.95	.013
21	2800	12.3	6.5	.32	28.98	29.30	.011
22	600	3.5	.4	.03	7.87	7.90	.004
23	2800	0.0	0.0	0.00	29.02	29.02	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	434	394	155	.03	113.48	205.07	132.65
2	536	513	96	.17	48.86	93.22	28.57
3	494	521	186	.82	9.38	19.72	11.59
4	538	489	317	1.36	5.24	9.49	10.10
5	420	435	399	1.14	2.89	5.96	8.99
6	346	212	853	4.59	1.25	1.53	10.11
7	360	150	1229	0.00	I	I	I
8	492	158	1339	5.03	1.07	.68	9.54
9	318	320	1338	0.00	I	I	I
10	168	826	1290	0.00	I	I	I
11	412	395	155	.03	108.97	207.90	134.98
12	35	14	17	0.00	R	R	R
13	57	1689	968	5.34	.11	6.33	5.96
14	109	1174	1044	10.88	.22	4.71	6.89
15	213	742	947	6.17	.47	3.28	6.88
16	188	525	926	9.52	.47	2.61	7.56
17	390	310	706	6.50	1.42	2.21	8.27
18	464	559	365	0.00	I	I	I
19	430	612	297	2.49	4.31	12.20	9.73
20	674	727	185	0.00	I	I	I
21	752	753	136	0.00	I	I	I
22	440	356	111	.03	114.76	184.97	94.71
23	88	14	6	0.00	R	R	R

CYCLE COMPOSITE BSHC = 1.469 GRAM/BHP HR
BSCO+ = 4.732 GRAM/BHP HR
BSNO2++= 8.217 GRAM/BHP HR
BSHC + BSNO2++= 9.685 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-8. ENGINE I EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3448-001 DATE OF TEST: 5-23-73 TEST-1 RUN-2
ENGINE: 1-0 BASELINE STD CONF LOW SAC INJ 16 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	3.5	.4	.03	7.87	7.90	.004
2	1700	12.3	4.0	.13	18.80	18.93	.007
3	1700	36.8	11.9	.17	20.27	20.44	.009
4	1700	84.0	27.2	.22	19.32	19.54	.011
5	1700	115.5	37.4	.27	19.78	20.05	.014
6	1700	234.6	75.9	.43	19.27	19.70	.022
7	1700	355.4	115.0	.63	19.40	20.03	.033
8	1700	386.9	125.2	.71	19.49	20.20	.036
9	1700	432.4	140.0	.78	19.44	20.22	.040
10	1700	472.7	153.0	.87	18.80	19.67	.047
11	600	3.5	.4	.03	8.00	8.03	.004
12	1700	0.0	0.0	0.00	18.55	18.55	0.000
13	2800	397.4	211.9	1.37	28.81	30.18	.047
14	2800	371.1	197.8	1.24	28.69	29.93	.043
15	2800	332.6	177.3	1.10	28.69	29.79	.038
16	2800	299.4	159.6	1.00	28.69	29.70	.035
17	2800	201.3	107.3	.79	28.69	29.48	.028
18	2800	101.5	54.1	.51	28.69	29.20	.018
19	2800	71.8	38.3	.44	28.59	29.03	.015
20	2800	31.5	16.8	.36	28.59	28.95	.013
21	2800	10.5	5.6	.32	28.48	28.80	.011
22	600	3.5	.4	.03	8.90	8.93	.004
23	2800	0.0	0.0	0.00	28.76	28.76	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	448	451	97	.03	116.84	234.44	83.02
2	506	538	120	.24	31.88	67.57	24.81
3	504	570	159	.71	11.43	25.75	11.77
4	436	499	271	1.36	4.13	9.42	8.42
5	424	462	369	1.12	3.00	6.51	8.55
6	332	239	829	4.56	1.14	1.63	9.29
7	388	178	1203	0.00	I	I	I
8	444	185	1410	5.01	.95	.78	9.83
9	280	390	1444	0.00	I	I	I
10	154	846	1081	0.00	I	I	I
11	412	429	116	.03	109.22	226.00	100.34
12	35	14	17	0.00	R	R	R
13	52	1701	1095	5.30	.10	6.37	6.74
14	99	1239	1105	10.88	.20	4.93	7.22
15	209	835	1074	6.21	.45	3.69	7.80
16	202	667	985	9.58	.50	3.26	7.92
17	302	351	767	6.44	1.09	2.53	9.08
18	442	588	390	0.00	I	I	I
19	602	649	318	2.49	6.03	12.95	10.42
20	690	770	218	0.00	I	I	I
21	720	810	156	0.00	I	I	I
22	432	422	114	.03	120.23	233.79	103.55
23	102	14	5	0.00	R	R	R

CYCLE COMPOSITE BSHC = 1.444 GRAM/BHP HR
BSCO+ = 5.147 GRAM/BHP HR
BSNO2++= 8.528 GRAM/BHP HR
BSHC + BSNO2++= 9.972 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-9. ENGINE I EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001 DATE OF TEST: 5-23-73 TEST-1 RUN-3
ENGINE: 1-0 BASELINE STD CONF LOW SAC INJ 16 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.02	7.70	7.72	.003
2	1700	8.8	2.8	.14	18.68	18.82	.008
3	1700	35.0	11.3	.16	18.62	18.78	.009
4	1700	85.8	27.8	.22	19.01	19.23	.011
5	1700	117.3	38.0	.27	18.62	18.89	.014
6	1700	236.3	76.5	.45	19.01	19.46	.024
7	1700	357.1	115.6	.63	18.62	19.25	.034
8	1700	386.9	125.2	.64	18.39	19.03	.035
9	1700	437.7	141.7	.77	18.68	19.45	.041
10	1700	469.2	151.9	.88	18.27	19.15	.048
11	600	1.8	.2	.03	8.18	8.21	.004
12	1700	0.0	0.0	0.00	18.06	18.06	0.000
13	2800	397.4	211.9	1.37	27.29	28.66	.050
14	2800	367.6	196.0	1.23	27.64	28.87	.045
15	2800	329.1	175.5	1.08	27.29	28.37	.040
16	2800	297.6	158.7	1.02	27.47	28.49	.037
17	2800	199.6	106.4	.72	27.56	28.28	.026
18	2800	98.0	52.3	.50	27.64	28.14	.018
19	2800	71.8	38.3	.45	27.64	28.09	.016
20	2800	31.5	16.8	.37	27.29	27.66	.013
21	2800	8.8	4.7	.32	27.29	27.61	.012
22	600	3.5	.4	.03	8.18	8.21	.004
23	2800	0.0	0.0	0.00	28.01	28.01	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	406	425	106	.01	807.00	431.96	177.43
2	528	542	126	.17	46.30	44.63	36.27
3	514	501	155	.68	11.84	21.08	11.08
4	462	490	260	1.39	4.28	8.01	7.77
5	410	374	382	1.14	2.64	4.96	8.22
6	360	166	834	4.59	1.21	1.11	4.17
7	434	103	1274	0.00	I	I	I
8	468	191	1324	5.01	.44	.57	8.64
9	286	376	1264	0.00	I	I	I
10	166	882	1218	0.00	I	I	I
11	426	463	111	.01	230.43	500.27	196.55
12	36	14	17	0.00	R	R	R
13	36	1683	484	5.30	.06	5.94	5.78
14	110	1875	474	10.78	.21	4.94	6.23
15	202	792	401	6.14	.43	3.37	6.24
16	204	731	880	9.52	.48	3.95	6.82
17	340	356	671	6.38	1.14	2.94	7.70
18	450	664	370	0.00	I	I	I
19	524	624	304	2.49	5.08	12.14	4.80
20	656	744	206	0.00	I	I	I
21	756	772	153	0.00	I	I	I
22	440	404	108	.03	114.26	220.68	45.47
23	45	14	5	0.00	R	R	R

CYCLE COMPOSITE BSHC = 1.452 GRAM/BHP HR
BSCO+ = 4.874 GRAM/BHP HR
BSNO2++= 7.543 GRAM/BHP HR
BSHC + BSNO2++= 8.995 GRAM/BHP HR

TABLE A-10. ENGINE I EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001 DATE OF TEST: 5-25-73 TEST-2 RUN-1
ENGINE: 1-1 CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.02	5.90	5.92	.004
2	1700	14.0	4.5	.13	16.11	16.24	.008
3	1700	40.3	13.0	.17	16.51	16.68	.010
4	1700	87.5	28.3	.23	16.51	16.74	.014
5	1700	117.3	38.0	.27	16.11	16.38	.017
6	1700	234.6	75.9	.43	16.12	16.55	.027
7	1700	353.6	114.5	.64	16.12	16.76	.040
8	1700	388.6	125.8	.72	16.09	16.81	.045
9	1700	434.2	140.5	.78	18.48	19.26	.042
10	1700	467.4	151.3	.89	18.84	19.73	.047
11	600	1.4	.2	.02	6.06	6.08	.004
12	2800	0.0	0.0	0.00	17.96	17.96	0.000
13	2800	392.2	209.1	1.38	28.74	30.12	.048
14	2800	364.1	194.1	1.26	28.82	30.08	.044
15	2800	320.4	170.8	1.12	24.13	25.25	.047
16	2800	292.4	155.9	1.05	23.36	24.41	.045
17	2800	196.1	104.5	.75	23.73	24.48	.032
18	2800	101.5	54.1	.52	23.36	23.88	.022
19	2800	71.8	38.3	.45	23.37	23.82	.019
20	2800	29.8	15.9	.36	23.74	24.10	.015
21	2800	7.0	3.7	.32	23.37	23.69	.014
22	2800	1.8	.9	.04	5.68	5.72	.007
23	600	0.0	0.0	0.00	23.75	23.75	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	272	407	108	.01	106.37	316.74	138.83
2	818	564	102	.27	24.50	53.20	15.86
3	446	382	147	.78	7.53	12.86	8.13
4	111	14	201	1.42	.07	.21	5.14
5	63	13	244	1.14	.36	.14	4.54
6	31	43	362	4.56	.04	.24	3.40
7	33	41	557	0.00	I	I	I
8	14	44	505	5.03	.03	.15	2.41
9	18	44	1006	0.00	I	I	I
10	11	36	466	0.00	I	I	I
11	280	337	87	.01	112.45	264.82	113.74
12	7	14	11	0.00	R	R	R
13	5	62	843	5.23	.01	.24	5.25
14	4	53	828	10.68	.01	.22	5.52
15	4	64	432	5.98	.01	.25	2.76
16	5	46	438	9.35	.01	.14	2.47
17	14	47	378	6.27	.04	.24	3.02
18	27	53	275	0.00	I	I	I
19	38	36	215	2.49	.31	.58	5.74
20	44	36	144	0.00	I	I	I
21	63	28	117	0.00	I	I	I
22	264	365	103	.07	21.77	58.70	27.14
23	16	14	6	0.00	R	R	R

CYCLE COMPOSITE BSHC = .399 GRAM/BHP HR
BSCO+ = .453 GRAM/BHP HR
BSNO2++= 4.301 GRAM/BHP HR
BSHC + BSNO2++= 4.701 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-11. ENGINE 1 EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001 DATE OF TEST: 5-25-73 TEST-2 RUN-2
ENGINE: 1-1 CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.03	6.69	6.72	.005
2	1700	10.5	3.4	.13	16.38	16.51	.008
3	1700	40.3	13.0	.16	15.98	16.14	.010
4	1700	87.6	28.3	.24	16.77	17.01	.014
5	1700	120.8	39.1	.29	17.11	17.40	.017
6	1700	232.8	75.4	.44	15.93	16.37	.028
7	1700	353.6	114.5	.64	15.93	16.57	.040
8	1700	388.6	125.8	.72	15.57	16.29	.047
9	1700	434.2	140.5	.82	19.00	19.82	.043
10	1700	464.4	150.3	.87	18.60	19.47	.047
11	600	1.8	.2	.02	5.62	5.64	.004
12	2800	0.0	0.0	0.00	17.34	17.34	0.000
13	2800	388.6	207.2	1.37	27.97	29.34	.049
14	2800	362.4	193.2	1.26	28.33	29.59	.044
15	2800	322.1	171.7	1.14	24.18	25.32	.047
16	2800	295.9	157.7	1.06	23.50	24.56	.045
17	2800	197.6	105.3	.77	23.50	24.27	.033
18	2800	101.5	54.1	.52	23.50	24.02	.022
19	2800	71.8	38.3	.45	23.49	23.94	.019
20	2800	31.5	16.8	.36	23.49	23.85	.015
21	2800	7.0	3.7	.31	23.49	23.80	.013
22	2800	1.8	.9	.03	5.87	5.90	.006
23	600	0.0	0.0	0.00	23.88	23.88	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	289	372	97	.01	126.02	329.12	191.03
2	968	467	91	.20	30.00	59.69	19.18
3	999	369	138	.78	7.26	12.00	7.37
4	96	9	213	1.42	.76	.19	5.52
5	57	6	265	1.17	.33	.07	5.10
6	91	26	359	4.52	.12	.15	3.37
7	23	13	556	0.00	I	I	I
8	15	13	481	5.03	.03	.04	2.69
9	9	13	472	0.00	I	I	I
10	7	18	448	0.00	I	I	I
11	228	303	189	.01	84.95	225.13	157.13
12	22	14	11	0.00	R	R	R
13	9	62	871	5.18	.01	.23	5.33
14	3	50	849	10.63	.01	.20	5.62
15	2	37	438	6.01	.00	.14	2.79
16	3	50	447	9.46	.01	.20	3.01
17	12	51	377	6.33	.04	.31	3.78
18	28	53	261	0.00	I	I	I
19	38	53	220	2.94	.26	.07	5.95
20	41	40	154	0.00	I	I	I
21	54	34	123	0.00	I	I	I
22	274	372	103	.07	22.88	61.04	28.11
23	25	14	5	0.00	R	R	R

CYCLE COMPOSITE BSHC = .389 GRAM/BHP HR
BSCO+ = .876 GRAM/BHP HR
BSNO2++= 4.329 GRAM/BHP HR
BSHC + BSNO2++= 4.718 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-12. ENGINE 1 EXPERIMENTAL 23-MODE GASEOUS EMISSIONS RESULTS

PROJECT: 11-3438-001 DATE OF TEST: 5-25-73 TEST-2 RUN-3
ENGINE: 1-1 CONT CONF LOW SAC INJ OXID CAT EGR 13 BTC TIMING

MODE	ENGINE SPEED RPM	TORQUE LB-FT	POWER BHP	FUEL FLOW LB/MIN	AIR FLOW LB/MIN	EXHAUST FLOW LB/MIN	FUEL AIR RATIO
1	600	1.8	.2	.02	6.34	6.36	.004
2	1700	12.3	4.0	.12	15.57	15.69	.008
3	1700	42.0	13.6	.18	16.44	16.62	.011
4	1700	87.5	28.3	.23	16.66	16.89	.014
5	1700	117.3	38.0	.28	16.26	16.54	.017
6	1700	236.3	76.5	.44	16.26	16.70	.027
7	1700	357.1	115.6	.67	15.87	16.54	.042
8	1700	388.6	125.8	.73	15.87	16.60	.046
9	1700	434.2	140.5	.84	19.28	20.12	.044
10	1700	467.4	151.3	.88	18.93	19.81	.047
11	600	1.8	.2	.02	5.89	5.91	.004
12	2800	0.0	0.0	0.00	17.34	17.34	0.000
13	2800	388.6	207.2	1.37	28.27	29.64	.048
14	2800	362.4	193.2	1.25	28.62	29.87	.044
15	2800	322.1	171.7	1.11	24.16	25.27	.046
16	2800	287.1	153.1	1.06	23.41	24.47	.045
17	2800	199.6	106.4	.76	23.41	24.17	.032
18	2800	99.8	53.2	.52	23.41	23.93	.022
19	2800	71.8	38.3	.44	23.33	23.77	.019
20	2800	31.5	16.8	.35	23.33	23.68	.015
21	2800	7.0	3.7	.31	23.33	23.64	.013
22	2800	1.8	.9	.03	6.26	6.29	.005
23	600	0.0	0.0	0.00	23.98	23.98	0.000

MODE	HC PPM	CO+ PPM	NO++ PPM	WEIGHTED BHP	BSHC G/HP HR	BSCO+ G/HP HR	BSNO2++ G/HP HR
1	279	367	99	.01	117.21	307.85	136.03
2	504	445	104	.24	26.32	51.50	17.79
3	446	354	150	.82	7.20	11.38	7.44
4	114	40	214	1.42	.44	.62	5.64
5	64	24	277	1.14	.37	.28	5.21
6	43	28	393	4.64	.12	.16	3.70
7	23	33	565	0.00	I	I	I
8	13	37	474	5.03	.02	.13	2.73
9	9	24	483	0.00	I	I	I
10	7	24	415	0.00	I	I	I
11	228	331	185	.01	84.01	257.59	160.09
12	40	14	11	0.00	R	R	R
13	1	75	727	5.18	.00	.28	4.44
14	3	66	712	10.63	.01	.27	4.76
15	3	53	388	6.01	.01	.20	2.43
16	4	65	375	9.18	.01	.28	2.54
17	13	53	330	6.38	.04	.32	3.24
18	23	56	211	0.00	I	I	I
19	31	64	174	2.44	.25	1.08	4.80
20	34	63	125	0.00	I	I	I
21	56	55	103	0.00	I	I	I
22	227	307	80	.07	20.20	54.34	23.31
23	28	14	5	0.00	R	R	R

CYCLE COMPOSITE BSHC = .407 GRAM/BHP HR
BSCO+ = .942 GRAM/BHP HR
BSNO2++= 3.897 GRAM/BHP HR
BSHC + BSNO2++= 4.304 GRAM/BHP HR

+ CONVERTED TO WET BASIS
++ CONVERTED TO WET BASIS AND CORRECTED TO 75 GRAINS WATER PER LB. DRY AIR

TABLE A-13. ENGINE 1-0 FEDERAL SMOKE TEST TRACE EVALUATION

Engine No. 1-0 Date 6-6-73 Evaluated By KH

Model Engine ______ Run No. 1

Accelerations

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	12.5	1	8.0	1	7.0
2	21.0	2	16.5	2	12.5
3	18.5	3	15.0	3	12.0
4	13.0	4	11.0	4	10.0
5	10.0	5	8.8	5	8.5
6	7.5	6	7.5	6	7.9
7	6.8	7	6.6	7	6.6
8	7.2	8	7.0	8	7.0
9	7.5	9	7.2	9	7.0
10	7.4	10	8.0	10	7.0
11	74	11	8.6	11	8.0
12	8.5	12	8.4	12	7.5
13	9.0	13	8.4	13	8.5
14	8.5	14	8.6	14	9.5
15	9.3	15	10.0	15	9.5

Total Smoke % 154.1 138.6 128.5

Factor (a) = $\frac{421.2}{45}$ = 9.4 %

Lugging

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	11.3	1	10.0	1	9.5
2	11.5	2	10.2	2	9.5
3	10.0	3	10.2	3	9.5
4	9.5	4	9.8	4	10.0
5	10.0	5	9.5	5	9.0

Total Smoke % 52.3 49.7 47.5

Factor (b) = $\frac{149.5}{15}$ = 10.0 %

Comments:

21.0	15.5	12.5
18.5	15.0	12.0
13.0	11.0	10.0
52.5	41.5	34.5

$\frac{128.5}{9}$ = 14.3 % "C" factor

TABLE A-14. ENGINE 1-0 FEDERAL SMOKE TEST TRACE EVALUATION

Engine No. 1-0 Date 6-6-73 Evaluated By KH

Model Engine ____________ Run No. 2

Accelerations

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	7.0	1	13.5	1	6.5
2	12.5	2	16.0	2	12.5
3	12.0	3	12.5	3	13.0
4	9.8	4	9.0	4	10.0
5	7.5	5	7.3	5	7.3
6	6.3	6	6.5	6	7.0
7	6.0	7	6.3	7	6.0
8	5.5	8	6.3	8	6.3
9	6.2	9	6.5	9	6.5
10	6.5	10	7.0	10	9.0
11	6.5	11	7.3	11	7.6
12	7.5	12	7.3	12	8.5
13	8.4	13	8.2	13	9.0
14	8.5	14	8.5	14	9.0
15	8.5	15	8.7	15	9.5

Total Smoke % 118.7 130.9 127.7

Factor (a) = $\frac{377.3}{45}$ = 8.4 %

Lugging

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	11.0	1	9.5	1	11.0
2	10.0	2	11.0	2	13.0
3	10.2	3	10.0	3	12.0
4	9.8	4	11.0	4	9.5
5	10.0	5	11.0	5	9.5

Total Smoke % 51.0 52.5 55.0

Factor (b) = $\frac{158.5}{15}$ = 10.6 %

Comments:

12.5	16.0	13.0
12.0	13.5	13.0
11.0	12.5	12.5
35.5	42.0	38.5

$\frac{116.0}{9}$ 12.9 % "c" factor

TABLE A-15. ENGINE 1-1 FEDERAL SMOKE TEST TRACE EVALUATION

Engine No. 1-1 Date 6-5-73 Evaluated By KH

Model Engine ________ Run No. 1

Accelerations

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	10.0	1	7.0	1	10.5
2	16.5	2	13.5	2	15.0
3	17.0	3	13.0	3	13.0
4	15.0	4	10.5	4	9.5
5	12.0	5	8.7	5	9.0
6	11.0	6	7.7	6	7.5
7	8.0	7	7.0	7	6.5
8	8.5	8	7.0	8	7.0
9	7.5	9	7.0	9	7.5
10	7.5	10	7.3	10	8.0
11	8.0	11	7.7	11	8.5
12	8.0	12	8.5	12	9.0
13	9.0	13	8.5	13	9.0
14	9.0	14	9.0	14	9.5
15	10.2	15	9.2	15	9.5

Total Smoke % 157.2 131.6 139.0

Factor (a) = $\frac{427.8}{45}$ = 9.5 %

Lugging

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	12.0	1	11.0	1	12.5
2	12.0	2	11.0	2	11.0
3	12.0	3	11.0	3	11.0
4	12.0	4	11.0	4	11.0
5	11.0	5	11.0	5	12.5

Total Smoke % 59.0 55.0 58.0

Factor (b) = $\frac{172.0}{15}$ = 11.5 %

Comments:

17.0	13.5	15.0
16.5	13.0	13.0
15.0	11.0	12.5
48.5	37.5	40.5

$\frac{126.5}{9}$ = 14.1 % "C" facto

TABLE A-16. ENGINE 1-1 FEDERAL SMOKE TEST TRACE EVALUATION

Engine No. 1-1 Date 6-5-73 Evaluated By KH

Model Engine ______ Run No. 2

Accelerations

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	14.0	1	9.0	1	13.5
2	16.5	2	13.5	2	15.0
3	13.0	3	12.5	3	12.0
4	8.5	4	9.5	4	9.0
5	8.5	5	8.8	5	9.5
6	7.0	6	9.0	6	8.5
7	7.5	7	8.0	7	8.0
8	11.0	8	8.0	8	8.5
9	7.8	9	8.5	9	8.8
10	7.8	10	9.5	10	9.5
11	8.5	11	10.5	11	9.0
12	9.0	12	10.0	12	10.0
13	9.8	13	10.5	13	10.4
14	10.0	14	11.0	14	10.2
15	11.5	15	10.5	15	11.0
Total Smoke %	150.4		148.8		152.9

Factor (a) = $\frac{452.1}{45}$ = 10.0 %

Lugging

First Sequence		Second Sequence		Third Sequence	
Interval No.	Smoke %	Interval No.	Smoke %	Interval No.	Smoke %
1	10.5	1	12.5	1	12.5
2	10.5	2	12.0	2	12.0
3	9.5	3	11.5	3	11.8
4	9.8	4	11.5	4	11.0
5	10.0	5	11.5	5	10.5
Total Smoke %	50.3		59.0		57.8

Factor (b) = $\frac{167.1}{15}$ = 11.1 %

Comments:

16.5	13.5	15.0
14.0	12.5	13.5
13.0	12.5	12.5
43.5	38.5	41.0

$\frac{123.0}{9}$ = 13.7 % "c" factor

TABLE A-17. ENGINE 1 SMOKE MAXIMUM POWER CURVE RESULTS

Engine Speed rpm	Run 1	Run 2	Average	Run 1	Run 2	Average	Run 1	Run 2	Average	Run 1	Run 2	Average
2800	210.9	208.9	209.9	197.8	200.6	199.2	12.0	12.0	12.0	11.5	12.5	12.0
2600	204.6	205.4	205.0	199.4	196.8	198.1	9.5	9.5	9.5	10.5	11.0	10.8
2400	193.6	195.2	194.4	189.4	190.4	189.9	9.0	8.5	8.8	9.0	9.0	9.0
2200	182.5	182.5	182.5	183.2	176.7	179.9	8.5	8.0	8.3	8.5	9.0	8.8
2000	171.4	171.4	171.4	168.8	166.8	167.8	9.5	9.0	9.3	9.5	9.5	9.5
1800	160.8	157.8	159.3	156.0	154.2	155.1	10.0	10.0	10.0	11.0	12.0	11.5
1600	142.8	143.3	143.0	145.5	140.2	142.8	11.0	11.0	11.0	12.0	12.5	12.3

TABLE A-18. ENGINE 1-1 PART POWER SMOKE RESULTS

Stationary Operated 75% Max Power		
Engine rpm	obs Bhp	Smoke Opacity, %
2800	149	13.5
2600	148	10.0
2400	142	7.5
2200	135	7.0
2000	126	4.5
1800	116	5.0
1600	107	4.0

Chassis Operated			
Engine rpm	EGR System	Wheel obs hp	Smoke Opacity, %
2700 (4th Gear, 45 mph)	off	150	15.5
	off	145	12.5
	off	142	11.0
	on/off	140	9-14
	on	139	16.5
	on	130	14.5
	on	120	12.5
	on	100	8.0
2300 (4th Gear, 38 mph)	off	140	13.0
	off	130	10.0
	on/off	125	8-13
	on	124	9.5
	on	120	6.5
	on	110	5.5
	on	100	6.0
1700 (4th Gear, 28 mph)	off	120	12.5
	off	110	4.5
	on/off	105	5-10
	on	100	4.5
	on	95	4
	on	90	3
	on	80	1.5

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                      TABLE A-19.             VEHICLE EMISSION RESULTS

UNIT NO.  1-1        TEST NO. 1          DATE  6/19/73                   MFGR. CODE  1                YR.  1970
VEHICLE MODEL   TRACTOR-TRAILER          ENGINE  1-1   CID *             CURB WT.  15,930             GVW  45,000
                                                              LA-4 DYNO TEST WT    25,000

BAROMETER  29.12 IN.HG.                                             WET BULB TEMP 69.0 DEG. F
DRY BULB TEMP.  78.0 DEG. F                                         ABS. HUMIDITY 98.0 GRAINS/LB
REL. HUMIDITY     61 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                     1              2
     FINAL WT.,    GRAMS                        -0.00          -0.00
     INITIAL WT., GRAMS                         -0.00          -0.00
     DIFFERENCE    GRAMS                         0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                          0.00 GRAMS

EXHAUST EMISSIONS

                                                                    BLOWER INLET PRESS., G1    6.5 IN. H2O
     BLOWER DIF. PRESS., G2,  12.0 IN. H2O                          BLOWER INLET TEMP.  150 DEG. F

     BAG RESULTS
     BAG NO.                                      1              2              3
     BLOWER REVOLUTIONS                         9986          16899          9682
     HC    SAMPLE  METER READING/SCALE          31.8/2         18.0/2         19.0/2
     HC    SAMPLE  PPM                           32             18             19
     HC    BACKGRD METER READING/SCALE           8.0/2          8.0/2          8.0/2
     HC    BACKGRD PPM                           8              8              8
     CO    SAMPLE  METER READING/SCALE          29.3/3          4.0/3          7.5/3
     CO    SAMPLE  PPM                           17             2              5
     CO    BACKGRD METER READING/SCALE           2.5/3          1.5/3          4.5/3
     CO    BACKGRD PPM                           2              1              3
     CO2   SAMPLE  METER READING/SCALE          73.9/2         47.3/2         71.8/2
     CO2   SAMPLE  PERCENT                      2.23           1.32           2.15
     CO2   BACKGRD METER READING/SCALE           3.2/2          3.6/2          3.2/2
     CO2   BACKGRD PERCENT                      .08            .09            .08
     NOX   SAMPLE  METER READING/SCALE          33.1/3         19.9/3         38.2/3
     NOX   SAMPLE  PPM                          99.3           59.7          114.6
     NOX   BACKGRD METER READING/SCALE          -2.7/3         -2.4/3         -3.2/3
     NOX   BACKGRD PPM                          -8.1           -7.2           -9.6

     HC    CONCENTRATION PPM                     25             11             12
     CO    CONCENTRATION PPM                     15             2              2
     CO2   CONCENTRATION PCT                    2.16           1.29           2.09
     NOX   CONCENTRATION PPM                   106.0           66.2          122.7
     HC    MASS GRAMS                           2.11           1.99           .99
     CO    MASS GRAMS                           2.53           .42            .33
     CO2   MASS GRAMS                        5786.60        5458.71        5377.03
     NOX   MASS GRAMS                          32.05          32.84          35.72

     WEIGHTED MASS HC        .39 GRAMS/MILE
     WEIGHTED MASS CO        .23 GRAMS/MILE
     WEIGHTED MASS CO2   1468.25 GRAMS/MILE
     WEIGHTED MASS NOX      8.93 GRAMS/MILE
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                    TABLE A-                VEHICLE EMISSION RESULTS

UNIT NO.  1-1        TEST NO. 2          DATE  6/20/73                  MFGR. CODE  1                       YR.  1970
VEHICLE MODEL    TRACTOR-TRAILER         ENGINE  1-1   CID *              CURB WT.  15,930                  GVW  45,000
                                                               LA-4 DYNO TEST WT.   25,000

BAROMETER  29.24 IN.HG.                                         WET BULB TEMP 65.0 DEG. F
DRY BULB TEMP.  77.0 DEG. F                                     ABS. HUMIDITY 73.1 GRAINS/LB
REL. HUMIDITY      51 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                       1               2
     FINAL WT.,    GRAMS                        -0.00           -0.00
     INITIAL WT., GRAMS                         -0.00           -0.00
     DIFFERENCE    GRAMS                         0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                               0.00 GRAMS

EXHAUST EMISSIONS

                                                                BLOWER INLET PRESS., G1   6.5 IN. H2O
     BLOWER DIF. PRESS., G2,  12.0 IN. H2O                      BLOWER INLET TEMP.  148 DEG. F

     BAG RESULTS
     BAG NO.                                        1               2               3
     BLOWER REVOLUTIONS                          9937           16814            9664
     HC    SAMPLE  METER READING/SCALE         35.8/2          24.0/2          21.0/2
     HC    SAMPLE  PPM                             36              24              21
     HC    BACKGRD METER READING/SCALE          8.0/2           8.0/2           8.0/2
     HC    BACKGRD PPM                              8               8               8
     CO    SAMPLE  METER READING/SCALE         30.0/3           5.9/3           7.6/3
     CO    SAMPLE  PPM                             18               4               5
     CO    BACKGRD METER READING/SCALE          3.8/3           3.5/3           5.5/3
     CO    BACKGRD PPM                              2               2               3
     CO2   SAMPLE  METER READING/SCALE         73.7/2          47.3/2          69.3/2
     CO2   SAMPLE  PERCENT                     2.22            1.32            2.06
     CO2   BACKGRD METER READING/SCALE          3.4/2           4.6/2           2.8/2
     CO2   BACKGRD PERCENT                      .09             .12             .07
     NOX   SAMPLE  METER READING/SCALE         36.4/3          21.7/3          39.2/3
     NOX   SAMPLE  PPM                        109.2            65.1           117.6
     NOX   BACKGRD METER READING/SCALE         -5.2/3          -4.4/3          -5.5/3
     NOX   BACKGRD PPM                        -15.6           -13.2           -16.5

     HC    CONCENTRATION PPM                       29              17              14
     CO    CONCENTRATION PPM                       15               2               2
     CO2   CONCENTRATION PCT                     2.15            1.22            2.01
     NOX   CONCENTRATION PPM                    122.2            77.0           131.6
     HC    MASS GRAMS                            2.45            2.35            1.16
     CO    MASS GRAMS                            2.50             .44             .26
     CO2   MASS GRAMS                         5770.30         5438.28         5227.11
     NOX   MASS GRAMS                           33.77           35.36           35.35

     WEIGHTED MASS HC         .54 GRAMS/MILE
     WEIGHTED MASS CO         .22 GRAMS/MILE
     WEIGHTED MASS CO2    1453.19 GRAMS/MILE
     WEIGHTED MASS NOX       9.34 GRAMS/MILE
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                          TABLE A-21            VEHICLE EMISSION RESULTS

UNIT NO.  1-0        TEST NO. 3          DATE  6/21/73                 MFGR. CODE   1                YR.  1970
VEHICLE MODEL   TRACTOR-TRAILER          ENGINE   1-0 CID *            CURB WT.  15,930              GVW  45,000
                                                             LA-4 DYNO TEST WT.   25,000

BAROMETER  29.50 IN.HG.                                            WET BULB TEMP 66.0 DEG. F
DRY BULB TEMP.  77.0 DEG. F                                        ABS. HUMIDITY 78.1 GRAINS/LB
REL. HUMIDITY     54 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                   1                2
     FINAL WT.,   GRAMS                     -0.00            -0.00
     INITIAL WT., GRAMS                     -0.00            -0.00
     DIFFERENCE   GRAMS                      0.00             0.00

     TOTAL EVAPORATIVE EMISSIONS                                            0.00 GRAMS


EXHAUST EMISSIONS

                                                                   BLOWER INLET PRESS., G1   6.0 IN. H2O
     BLOWER DIF. PRESS., G2,  12.0 IN. H2O                         BLOWER INLET TEMP.  150 DEG. F

     BAG RESULTS
     BAG NO.                                    1                2                 3
     BLOWER REVOLUTIONS                      9715            16650              9810
     HC   SAMPLE  METER READING/SCALE     101.8/2           99.0/2            90.0/2
     HC   SAMPLE  PPM                         102               99                90
     HC   BACKGRD METER READING/SCALE      12.0/2           12.0/2            12.0/2
     HC   BACKGRD PPM                          12               12                12
     CO   SAMPLE  METER READING/SCALE      90.5/2           52.5/2            85.0/2
     CO   SAMPLE  PPM                         167               98               157
     CO   BACKGRD METER READING/SCALE       9.0/3            5.9/3             8.0/3
     CO   BACKGRD PPM                           5                4                 5
     CO2  SAMPLE  METER READING/SCALE      70.3/2           45.4/2            68.9/2
     CO2  SAMPLE  PERCENT                    2.10             1.27              2.05
     CO2  BACKGRD METER READING/SCALE       3.1/2            2.9/2             3.0/2
     CO2  BACKGRD PERCENT                     .08              .07               .08
     NOX  SAMPLE  METER READING/SCALE      61.2/3           40.9/3            64.6/3
     NOX  SAMPLE  PPM                       183.6            122.7             193.8
     NOX  BACKGRD METER READING/SCALE       1.5/3            1.6/3              .6/3
     NOX  BACKGRD PPM                         4.5              4.8               1.8

     HC   CONCENTRATION PPM                    92               83                80
     CO   CONCENTRATION PPM                   153               91               144
     CO2  CONCENTRATION PCT                  2.04             1.20              1.99
     NOX  CONCENTRATION PPM                 179.8            118.4             192.3
     HC   MASS GRAMS                         7.59            11.72              6.67
     CO   MASS GRAMS                        25.51            25.89             24.31
     CO2  MASS GRAMS                      5370.17          5392.71           5293.95
     NOX  MASS GRAMS                        50.07            56.15             54.07

     WEIGHTED MASS HC       2.51 GRAMS/MILE
     WEIGHTED MASS CO       6.76 GRAMS/MILE
     WEIGHTED MASS CO2   1429.26 GRAMS/MILE
     WEIGHTED MASS NOX     14.47 GRAMS/MILE
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                        TABLE  A- 22                VEHICLE EMISSION RESULTS

UNIT NO.  1-0          TEST NO. 4            DATE  6/22/73                      MFGR. CODE   1                          YR.  1970
VEHICLE MODEL   TRACTOR-TRAILER              ENGINE   1 -0 CID *                CURB WT.   15,930                       GVW  45,000
                                                               LA-4 DYNO TEST WT.   25,000

BAROMETER  29.48 IN.HG.                                                         WET BULB TEMP 66.0 DEG. F
DRY BULB TEMP.  77.0 DEG. F                                                     ABS. HUMIDITY 78.1 GRAINS/LB
REL. HUMIDITY      54 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                          1               2
     FINAL WT.,    GRAMS                           -0.00           -0.00
     INITIAL WT., GRAMS                            -0.00           -0.00
     DIFFERENCE    GRAMS                            0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                                 0.00 GRAMS


EXHAUST EMISSIONS

                                                                    BLOWER INLET PRESS., G1    6.5 IN. H2O
     BLOWER DIF. PRESS., G2,  12.0 IN. H2O                          BLOWER INLET TEMP.  141 DEG. F

     BAG RESULTS
     BAG NO.                                           1               2               3
     BLOWER REVOLUTIONS                             9891           16514            9850
     HC    SAMPLE  METER READING/SCALE            94.0/2         101.0/2          90.0/2
     HC    SAMPLE  PPM                                94             101              90
     HC    BACKGRD METER READING/SCALE            12.0/2          12.0/2          12.0/2
     HC    BACKGRD PPM                                12              12              12
     CO    SAMPLE  METER READING/SCALE            92.5/2          56.0/2          88.5/2
     CO    SAMPLE  PPM                               170             105             163
     CO    BACKGRD METER READING/SCALE             2.9/2           3.9/2           2.0/2
     CO    BACKGRD PPM                                 6               7               4
     CO2   SAMPLE  METER READING/SCALE            68.9/2          45.9/2          67.0/2
     CO2   SAMPLE  PERCENT                          2.05            1.28            1.98
     CO2   BACKGRD METER READING/SCALE             2.3/2           2.9/2           2.8/2
     CO2   BACKGRD PERCENT                           .06             .07             .07
     NOX   SAMPLE  METER READING/SCALE            54.7/3          42.3/3          68.2/3
     NOX   SAMPLE  PPM                             164.1           126.9           204.6
     NOX   BACKGRD METER READING/SCALE            -4.1/3          -2.0/3          -3.0/3
     NOX   BACKGRD PPM                             -12.3            -6.0            -9.0

     HC    CONCENTRATION PPM                          84              90              80
     CO    CONCENTRATION PPM                         156              94             151
     CO2   CONCENTRATION PCT                        2.00            1.22            1.92
     NOX   CONCENTRATION PPM                       174.5           132.3           212.3
     HC    MASS GRAMS                               7.16           12.85            6.78
     CO    MASS GRAMS                              26.90           26.95           25.92
     CO2   MASS GRAMS                            5447.51         5522.48         5212.52
     NOX   MASS GRAMS                              50.12           63.45           60.71

     WEIGHTED MASS HC        2.64 GRAMS/MILE
     WEIGHTED MASS CO        7.11 GRAMS/MILE
     WEIGHTED MASS CO2    1444.81 GRAMS/MILE
     WEIGHTED MASS NOX      15.95 GRAMS/MILE
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APPENDIX B

TASK 2 - ENGINE 2

MASS EMISSION RESULTS BY:
NINE MODE-FTP
NINE MODE-EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY:
1975 LIGHT DUTY FTP

TABLE B-1. COMPOSITE EMISSIONS FOR ENGINE 2

NINE-MODE FTP

				HC		CO	NO_2		Cycle BSFC
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	Lb-Bhp-Hr
1	2	3-28	2-0	3.59	4.46	22.9	15.87	15.53	0.723
1	3	3-28	2-0	3.65	4.62	21.4	16.66	15.98	0.723
2	3	3-29	2-0	3.87	4.82	22.0	16.96	16.93	0.723
		AVERAGE		3.7	4.6	22.1	16.5	16.1	0.723
5	2	4-12	2-1	2.64	2.62	2.01	8.58	8.63	0.767
5	3	4-12	2-1	3.06	2.80	1.94	8.61	8.74	0.767
5	4	4-13	2-1	2.76	2.54	1.94	8.52	8.24	0.767
		AVERAGE		2.8	2.7	2.0	8.6	8.6	0.767
6	1	4-13	2-2	2.13	2.46	6.24	8.62	8.52	0.776
6	2	4-13	2-2	2.43	1.96	4.65	8.87	9.12	0.776
6	3	4-13	2-2	2.03	1.94	6.50	8.70	8.59	0.776
		AVERAGE		2.2	2.1	5.8	8.7	8.8	0.776
6	4	4-23	2-2	2.1	2.0	7.9	8.5	8.0	0.776
12	1	4-24	2-0	4.26	5.73	18.1	15.17	14.89	0.731
12	2	4-24	2-0	4.33	5.58	16.6	16.31	16.38	0.731
		AVERAGE		4.3	5.7	17.4	15.7	15.6	0.731

* Engine 2-0 - Standard 1972 Configuration
Engine 2-1 - EGR, Air Injection and Oxidation Catalyst
Engine 2-2 - EGR and Oxidation Catalyst (No Air Injection)

TABLE B-1 (Cont'd). COMPOSITE EMISSIONS FOR ENGINE 2

NINE-MODE EPA

				HC		CO	NO_2		Cycle BSFC
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	Lb-Bhp-Hr
3	1	3-29	2-0	3.83	4.44	33.5	16.45	16.54	0.632
3	2	3-29	2-0	3.80	4.79	39.1	18.64	17.54	0.632
3	3	3-30	2-0	3.14	4.31	34.6	16.01	-----	0.632
		AVERAGE		3.6	4.5	35.4	17.2	17.0	0.632
8	1	4-17	2-1	2.02	2.14	33.5	9.49	9.34	0.713
8	2	4-17	2-1	2.05	1.47	11.1	9.39	9.56	0.713
8	3	4-17	2-1	2.18	1.86	10.0	10.18	10.40	0.713
8	4	4-19	2-1	2.44	1.60	8.2	9.09	9.16	0.713
		AVERAGE		2.2	1.8	≈16	9.5	9.6	0.713
9	1	4-17	2-2	2.07	1.99	23.1	10.42	10.23	0.714
9	2	4-18	2-2	2.19	2.97	44.7	9.75	9.53	0.714
9	3	4-19	2-2	2.41	2.60	51.3	9.80	9.58	0.714
		AVERAGE		2.2	2.5	≈40	10.0	9.8	0.714
23-MODE EPA									
7	1	4-16	2-0	----	7.98	62.9	-----	12.95	0.687
7	2	4-16	2-0	----	8.40	65.6	-----	11.60	0.688
7	3	4-16	2-0	----	7.84	53.7	-----	11.48	0.689
		AVERAGE			8.1	61		12.0	0.688
10	1	4-22	2-1	----	4.16	82.7	-----	7.29	0.741
10	2	4-23	2-1	----	4.10	75.4	-----	6.06	0.741
10	3	4-23	2-1	----	3.60	55.3	-----	6.02	0.741
		AVERAGE			4.0	71		6.5	0.736
11	1	4-22	2-2	----	3.91	84.6	-----	7.15	0.734
11	2	4-25	2-2	----	4.29	105.7	-----	6.14	0.735
11	3	4-25	2-2	----	3.64	97.8	-----	6.51	0.726
		AVERAGE			3.9	96.0		6.6	0.732

* Engine 2-0 - Standard 1972 Configuration
Engine 2-1 - EGR, Air Injection and Oxidation Catalyst
Engine 2-2 - EGR and Oxidation Catalyst (No Air Injection)

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                          TABLE B-2. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2=0   TEST=1  RUN=2    1972 STANDARD ENGINE  03-28-73       K =1.029      HUM = 84.7  GR/LB
-------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE            HC      CO     CO2      NO    CARBON    CONS.      HC      CO     NO2    FACT.    HC       CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE         167   1.750   12.39     135    14.320    1542      19     381       5    .232     4.5      88    1.1    0    19.0
2 16 HG         86    .220   13.27    1295    13.583    8119      56     266     257    .077     4.3      20   19.8   21    16.0
3 10 HG        100    .220   13.98    3402    14.308   13427     101     417    1060    .147    14.9      61  155.8   52    10.0
4 16 HG         63    .230   13.41    1446    13.708    8119      40     275     284    .077     3.1      21   21.9   21    16.0
5 19 HG         29    .170   13.13     447    13.331    5761      14     148      64    .057      .8       8    3.7    4    19.0
6 16 HG         38    .220   13.35    1466    13.611    8119      24     265     290    .077     1.9      20   22.3   21    16.0
7  3 HG         52    .860   13.41    1634    14.326   18462      72    2239     699    .113     8.2     253   79.0   75     3.0
8 16 HG         44    .750   13.50    1359    14.298    8119      27     860     256    .077     2.1      66   19.7   21    16.0
9 C.T.        2259    .400    7.78      97    10.619    1361     312     104       4    .143    44.6      15     .6    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.7      24   14.3
1 IDLE         167   1.750   12.39     135    14.320    1542      19     381       5    .232     4.5      88    1.1    0    19.0
2 16 HG         63    .230   13.53    1609    13.828    8119      40     273     313    .077     3.1      21   24.1   21    16.0
3 10 HG         89    .220   13.98    3617    14.296   13427      90     417    1128    .147    13.3      61  165.8   52    10.0
4 16 HG         39    .140   13.48    1427    13.662    8119      25     168     282    .077     1.9      13   21.7   21    16.0
5 19 HG         30    .190   13.20     504    13.422    5761      14     165      72    .057      .8       9    4.1    4    19.0
6 16 HG         47    .240   13.53    1504    13.821    8119      30     285     293    .077     2.3      22   22.6   21    16.0
7  3 HG         54    .790   13.69    1800    14.538   18462      74    2026     759    .113     8.4     229   85.8   75     3.0
8 16 HG         51    .260   13.69    1645    14.005    8119      32     304     317    .077     2.5      23   24.4   21    16.0
9 C.T.        2297    .400    8.14      97    11.021    1361     306     100       4    .143    43.8      14     .6    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.5      21   15.4
1 IDLE         193   2.510   12.74     148    15.458    1542      21     506       5    .232     4.8     117    1.1    0    19.0
2 16 HG         73    .260   13.76    1609    14.099    8119      45     302     307    .077     3.5      23   23.6   21    16.0
3 10 HG         91    .220   14.13    3736    14.448   13427      91     413    1153    .147    13.4      61  169.5   52    10.0
4 16 HG         56    .230   13.69    1700    13.980    8119      35     270     328    .077     2.7      21   25.2   21    16.0
5 19 HG         41    .170   13.40     462    13.614    5761      19     145      65    .057     1.1       8    3.7    4    19.0
6 16 HG         56    .230   13.60    1754    13.890    8119      35     272     340    .077     2.7      21   26.2   21    16.0
7  3 HG         57    .810   13.69    1728    14.562   18462      78    2074     727    .113     8.8     234   82.2   75     3.0
8 16 HG         51    .230   13.69    1584    13.975    8119      32     270     306    .077     2.5      21   23.6   21    16.0
9 C.T.        2211    .400    8.24     110    11.028    1361     295     100       5    .143    42.1      14     .6    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.6      23   15.7
1 IDLE         193   2.510   12.74     148    15.458    1542      21     506       5    .232     4.8     117    1.1    0    19.0
2 16 HG         70    .270   13.65    1320    13.996    8119      44     316     254    .077     3.4      24   19.6   21    16.0
3 10 HG         83    .210   14.13    3879    14.430   13427      83     395    1198    .147    12.3      58  176.2   52    10.0
4 16 HG         47    .220   13.65    1446    13.921    8119      30     259     280    .077     2.3      20   21.6   21    16.0
5 19 HG         37    .160   13.41     540    13.610    5761      17     137      76    .057     1.0       8    4.3    4    19.0
6 16 HG         51    .240   13.65    1624    13.945    8119      32     282     314    .077     2.5      22   24.2   21    16.0
7  3 HG         56    .820   13.78    1845    14.660   18462      76    2086     771    .113     8.6     236   87.2   75     3.0
8 16 HG         51    .230   13.75    1614    14.035    8119      32     269     310    .077     2.5      21   23.9   21    16.0
9 C.T.        2297    .450    8.33     123    11.261    1361     300     110       5    .143    42.9      16     .7    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.5      23   15.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.6      23   14.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     3.6      23   15.7
FOUR CYCLE COMPOSITE -                     HC- NDIR 0.35(     3.6) + 0.65(     3.6) =     3.586   GM/BHP HR
                                           CO- NDIR 0.35(    22.8) + 0.65(    22.9) =    22.900   GM/BHP HR
                                           NO2=NDIR 0.35(    14.8) + 0.65(    15.7) =    15.420   GM/BHP HR
                                                               CORRECTED NO2 =    15.865   GM/BHP HR
                                                                        BSFC =      .723   LB/BHP HR


-------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE          HC-FID    CO     CO2   NO-CL    CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE        3166   1.750   12.39      13    14.457    1542      34     377       0    .232     7.8      87     .1    0    19.0
2 16 HG       1181    .220   13.27    1206    13.608    8119      70     265     239    .077     5.4      20   18.4   21    16.0
3 10 HG       1776    .220   13.98    3475    14.378   13427     166     415    1077    .147    24.4      61  158.4   52    10.0
4 16 HG        901    .230   13.41    1388    13.730    8119      53     275     272    .077     4.1      21   21.0   21    16.0
5 19 HG        449    .170   13.13     388    13.345    5761      19     148      56    .057     1.1       8    3.2    4    19.0
6 16 HG        900    .220   13.35    1416    13.660    8119      54     264     279    .077     4.1      20   21.5   21    16.0
7  3 HG        951    .860   13.41    1570    14.365   18462     122    2233     670    .113    13.8     252   75.7   75     3.0
8 16 HG        724    .750   13.50    1306    14.322    8119      41     859     246    .077     3.2      66   18.9   21    16.0
9 C.T.       26031    .400    7.78      13    10.783    1361     329     102       1    .143    47.0      15     .1    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.9      24   14.0
1 IDLE        3166   1.750   12.39      13    14.457    1542      34     377       0    .232     7.8      87     .1    0    19.0
2 16 HG       1172    .230   13.53    1537    13.877    8119      69     272     299    .077     5.3      21   23.0   21    16.0
3 10 HG       1663    .220   13.98    3700    14.366   13427     155     415    1148    .147    22.8      61  168.8   52    10.0
4 16 HG        833    .140   13.48    1416    13.703    8119      49     168     279    .077     3.8      13   21.4   21    16.0
5 19 HG        450    .190   13.20     462    13.435    5761      19     165      66    .057     1.1       9    3.7    4    19.0
6 16 HG        879    .240   13.53    1487    13.858    8119      52     284     289    .077     4.0      22   22.3   21    16.0
7  3 HG        816    .790   13.69    1737    14.562   18462     104    2023     731    .113    11.7     229   82.6   75     3.0
8 16 HG        723    .260   13.69    1604    14.022    8119      42     304     308    .077     3.2      23   23.7   21    16.0
9 C.T.       25464    .400    8.14      13    11.086    1361     313      99       1    .143    44.7      14     .1    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.6      21   15.2
1 IDLE        3606   2.510   12.74      37    15.611    1542      36     501       1    .232     8.3     116     .3    0    19.0
2 16 HG       1107    .260   13.76    1506    14.131    8119      64     302     287    .077     4.9      23   22.1   21    16.0
3 10 HG       1586    .220   14.13    3800    14.509   13427     147     411    1168    .147    21.6      60  171.6   52    10.0
4 16 HG        847    .230   13.69    1662    14.005    8119      49     269     320    .077     3.8      21   24.6   21    16.0
5 19 HG        360    .170   13.40     400    13.606    5761      15     145      56    .057      .9       8    3.2    4    19.0
6 16 HG        880    .230   13.60    1725    13.918    8119      51     271     334    .077     4.0      21   25.7   21    16.0
7  3 HG        783    .810   13.69    1675    14.578   18462      99    2072     704    .113    11.2     234   79.6   75     3.0
8 16 HG        744    .230   13.69    1518    13.994    8119      43     270     292    .077     3.3      21   22.5   21    16.0
9 C.T.       25054    .400    8.24      13    11.145    1361     306      99       1    .143    43.7      14     .1    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.5      23   15.4
1 IDLE        3674   2.510   12.74      37    15.617    1542      36     501       1    .232     8.4     116     .3    0    19.0
2 16 HG       1061    .270   13.65    1287    14.026    8119      61     316     247    .077     4.7      24   19.0   21    16.0
3 10 HG       1076    .210   14.13    3750    14.448   13427     100     394    1157    .147    14.7      58  170.1   52    10.0
4 16 HG        812    .220   13.65    1412    13.951    8119      47     259     273    .077     3.6      20   21.0   21    16.0
5 19 HG        416    .160   13.41     468    13.612    5761      18     137      66    .057     1.0       8    3.7    4    19.0
6 16 HG        863    .240   13.65    1575    13.976    8119      50     282     304    .077     3.9      22   23.4   21    16.0
7  3 HG        812    .820   13.78    1842    14.681   18462     102    2083     769    .113    11.5     235   86.9   75     3.0
8 16 HG        689    .230   13.75    1568    14.049    8119      40     268     301    .077     3.1      21   23.2   21    16.0
9 C.T.       25084    .450    8.33      13    11.288    1361     302     110       1    .143    43.2      16     .1    0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.1      23   15.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.7      23   14.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.3      23   15.4
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(     4.7) + 0.65(     4.3) =     4.463   GM/BHP HR
                                           CO- NDIR 0.35(    22.7) + 0.65(    22.9) =    22.815   GM/BHP HR
                                           NO2-CL   0.35(    14.6) + 0.65(    15.4) =    15.094   GM/BHP HR
                                                               CORRECTED NO2 =    15.529   GM/BHP HR
                                                                        BSFC =      .723   LB/BHP HR
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                   TABLE B-3. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-0   TEST-1  RUN-3    1972 STANDARD ENGINE  03-28-73      K =1.029      HUM = 84.7  GR/LB
------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.     WEIGHTED GM/HR           MAN.
MODE          HC      CO     CO2     NO   CARBON   CONS.      HC     CO    NO2   FACT.    HC      CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------
1 IDLE       145   1.580   11.81    122   13.547    1542      18    363      5   .232    4.1     84    1.1    0   19.0
2 16 HG       70    .170   12.59   1385   12.836    8119      48    217    291   .077    3.7     17   22.4   21   16.0
3 10 HG       84    .130   13.13   3600   13.351   13427      91    264   1202   .147   13.4     39  176.7   52   10.0
4 16 HG       47    .160   12.62   1455   12.831    8119      32    205    306   .077    2.5     16   23.5   21   16.0
5 19 HG       33    .120   12.32    469   12.476    5761      16    112     72   .057     .9      6    4.1    9   19.0
6 16 HG       51    .160   12.59   1280   12.805    8119      35    205    269   .077    2.7     16   20.7   21   16.0
7  3 HG       54    .760   12.70   1707   13.518   10462      80   2097    774   .113    9.0    237   87.5   75    3.0
8 16 HG       44    .180   12.72   1388   12.948    8119      30    228    289   .077    2.3     18   22.3   21   16.0
9 C.T.      2297    .300    7.51     85   10.291    1361     328     80      4   .143   46.9     11     .5    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.8     20   15.8
1 IDLE       145   1.580   11.81    122   13.547    1542      18    363      5   .232    4.1     84    1.1    0   19.0
2 16 HG       51    .180   12.86   1203   13.095    8119      34    225    248   .077    2.6     17   19.1   21   16.0
3 10 HG       84    .150   13.41   3760   13.651   13427      89    298   1228   .147   13.1     44  180.5   52   10.0
4 16 HG       67    .170   12.84   1564   13.082    8119      45    213    322   .077    3.5     16   24.8   21   16.0
5 19 HG       44    .110   12.55    420   12.708    5761      22    101     63   .057    1.2      6    3.6    9   19.0
6 16 HG       55    .180   12.86   1584   13.099    8119      37    225    326   .077    2.8     17   25.1   21   16.0
7  3 HG       51    .750   12.99   1634   13.795   10462      74   2028    726   .113    8.3    229   82.0   75    3.0
8 16 HG       46    .180   13.05   1686   13.280    8119      30    222    342   .077    2.3     17   26.4   21   16.0
9 C.T.      2168    .310    7.96    115   10.611    1361     300     80      5   .143   42.9     11     .7    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.6     19   16.0
1 IDLE       285   2.850   11.81    185   14.968    1542      32    593      6   .232    7.4    138    1.5    0   19.0
2 16 HG       74    .200   12.90   1590   13.180    8119      49    249    325   .077    3.8     19   25.0   21   16.0
3 10 HG       79    .190   13.50   3651   13.775   13427      83    374   1181   .147   12.2     55  173.7   52   10.0
4 16 HG       48    .180   12.95   1426   13.182    8119      32    224    292   .077    2.5     17   22.5   21   16.0
5 19 HG       39    .110   12.59    540   12.742    5761      19    100     81   .057    1.1      6    4.6    9   19.0
6 16 HG       45    .200   12.86   1665   13.109    8119      30    250    342   .077    2.3     19   26.4   21   16.0
7  3 HG       38    .720   12.99   1791   13.751   10462      55   1953    798   .113    6.2    221   90.2   75    3.0
8 16 HG       29    .200   13.05   1590   13.281    8119      19    247    323   .077    1.5     19   24.8   21   16.0
9 C.T.      2125    .300    8.14    147   10.736    1361     291     77      6   .143   41.6     11     .9    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.5     22   16.3
1 IDLE       285   2.850   11.81    185   14.968    1542      32    593      6   .232    7.4    138    1.5    0   19.0
2 16 HG       88    .190   12.78   1584   13.065    8119      59    239    327   .077    4.5     18   25.2   21   16.0
3 10 HG       95    .190   13.40   3685   13.693   13427     101    376   1200   .147   14.8     55  176.4   52   10.0
4 16 HG       56    .190   12.86   1426   13.110    8119      37    238    293   .077    2.9     18   22.6   21   16.0
5 19 HG       41    .110   12.62    530   12.774    5761      20    100     79   .057    1.1      6    4.5    9   19.0
6 16 HG       56    .200   12.86   1665   13.120    8119      37    250    342   .077    2.9     19   26.3   21   16.0
7  3 HG       46    .740   12.86   1770   13.650   10462      67   2022    795   .113    7.6    228   89.8   75    3.0
8 16 HG       41    .190   12.88   1615   13.114    8119      27    238    332   .077    2.1     18   25.6   21   16.0
9 C.T.      2211    .390    7.96    165   10.738    1361     303    100      7   .143   43.3     14    1.0    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.8     23   16.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------     3.7     20   15.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------     3.6     22   16.3
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     3.7) + 0.65(     3.6) =    3.647   GM/BHP HR
                                          CO- NDIR 0.35(    19.5) + 0.65(    22.5) =   21.436   GM/BHP HR
                                          NO2-NDIR 0.35(    15.9) + 0.65(    16.3) =   16.191   GM/BHP HR
                                                              CORRECTED NO2 =   16.658   GM/BHP HR
                                                                       BSFC =     .723   LB/BHP HR


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             CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.     WEIGHTED GM/HR           MAN.
MODE        HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC     CO    NO2   FACT.  HC-FID    CO  NO2-CL   HP   VAC.
------------------------------------------------------------------------------------------------------
1 IDLE      2750   1.580   11.81     37   13.665    1542      31    360      1   .232    7.2     84     .3    0   19.0
2 16 HG      984    .170   12.59   1300   12.858    8119      62    217    273   .077    4.8     17   21.0   21   16.0
3 10 HG     1476    .130   13.13   3590   13.408   13427     148    263   1194   .147   21.7     39  175.5   52   10.0
4 16 HG      805    .160   12.62   1383   12.861    8119      51    204    290   .077    3.9     16   22.3   21   16.0
5 19 HG      401    .120   12.32    430   12.480    5761      19    112     66   .057    1.1      6    3.8    9   19.0
6 16 HG      760    .160   12.59   1240   12.826    8119      48    205    261   .077    3.7     16   20.1   21   16.0
7  3 HG      810    .760   12.70   1612   13.541   10462     110   2093    730   .113   12.5    237   82.5   75    3.0
8 16 HG      649    .180   12.72   1362   12.965    8119      41    228    283   .077    3.1     18   21.8   21   16.0
9 C.T.     26163    .300    7.51     37   10.426    1361     342     79      2   .143   48.8     11     .2    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     4.7     19   15.3
1 IDLE      2750   1.580   11.81     37   13.665    1542      31    360      1   .232    7.2     84     .3    0   19.0
2 16 HG      896    .180   12.86   1125   13.130    8119      55    225    231   .077    4.3     17   17.8   21   16.0
3 10 HG     1531    .150   13.41   3800   13.713   13427     150    297   1235   .147   22.0     44  181.6   52   10.0
4 16 HG      807    .170   12.84   1495   13.091    8119      50    213    308   .077    3.9     16   23.7   21   16.0
5 19 HG      343    .110   12.55    370   12.694    5761      16    101     56   .057     .9      6    3.2    9   19.0
6 16 HG      784    .180   12.86   1506   13.118    8119      49    225    309   .077    3.7     17   23.8   21   16.0
7  3 HG      707    .750   12.99   1540   13.811   10462      94   2025    683   .113   10.7    229   77.2   75    3.0
8 16 HG      662    .180   13.05   1587   13.296    8119      40    222    322   .077    3.1     17   24.8   21   16.0
9 C.T.     24544    .310    7.96     40   10.724    1361     311     79      2   .143   44.5     11     .2    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     4.4     19   15.5
1 IDLE      4554   2.850   11.81     50   15.115    1542      46    587      2   .232   10.8    136     .4    0   19.0
2 16 HG     1091    .200   12.90   1491   13.209    8119      67    248    304   .077    5.2     19   23.4   21   16.0
3 10 HG     1622    .190   13.50   3633   13.852   13427     157    372   1169   .147   23.1     55  171.9   52   10.0
4 16 HG      740    .180   12.95   1330   13.204    8119      46    224    272   .077    3.5     17   20.9   21   16.0
5 19 HG      358    .110   12.59    453   12.736    5761      16    101     68   .057     .9      6    3.9    9   19.0
6 16 HG      852    .200   12.86   1570   13.145    8119      53    250    322   .077    4.1     19   24.8   21   16.0
7  3 HG      704    .720   12.99   1687   13.780   10462      94   1948    750   .113   10.7    220   84.8   75    3.0
8 16 HG      606    .200   13.05   1455   13.311    8119      37    246    295   .077    2.8     19   22.7   21   16.0
9 C.T.     25011    .300    8.14     38   10.941    1361     311     75      2   .143   44.5     11     .2    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     4.6     22   15.5
1 IDLE      4554   2.850   11.81     50   15.115    1542      46    587      2   .232   10.8    136     .4    0   19.0
2 16 HG     1081    .190   12.78   1467   13.078    8119      67    238    302   .077    5.2     18   23.3   21   16.0
3 10 HG     1542    .190   13.40   3650   13.744   13427     151    375   1184   .147   22.1     55  174.0   52   10.0
4 16 HG      672    .190   12.86   1312   13.117    8119      42    238    270   .077    3.2     18   20.8   21   16.0
5 19 HG      358    .110   12.62    437   12.766    5761      16    100     65   .057     .9      6    3.7    9   19.0
6 16 HG      807    .200   12.86   1561   13.141    8119      50    250    320   .077    3.8     19   24.7   21   16.0
7  3 HG      754    .740   12.86   1675   13.675   10462     102   2018    751   .113   11.5    228   84.8   75    3.0
8 16 HG      628    .190   12.88   1475   13.133    8119      39    237    303   .077    3.0     18   23.3   21   16.0
9 C.T.     25423    .390    7.96     38   10.892    1361     318     98      2   .143   45.4     14     .2    0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     4.7     23   15.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------     4.6     19   15.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------     4.7     22   15.6
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     4.6) + 0.65(     4.7) =    4.624   GM/BHP HR
                                          CO- NDIR 0.35(    19.5) + 0.65(    22.4) =   21.345   GM/BHP HR
                                          NO2-CL   0.35(    15.4) + 0.65(    15.6) =   15.533   GM/BHP HR
                                                              CORRECTED NO2 =   15.980   GM/BHP HR
                                                                       BSFC =     .723   LB/BHP HR
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                  TABLE B-4. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-0   TEST-2  RUN-3    1972 STANDARD ENGINE  03-29-73     K =1.029     HUM = 84.7  GR/LB
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                CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE            HC      CO    CO2      NO     CARBON   CONS.       HC      CO     NO2    FACT.    HC        CO     NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         166   2.250  11.44     110    13.869    1542        20     505       4    .232      4.6     117      .9      0    19.0
2 16 HG         94    .160  12.20    1115    12.462    8119        66     211     241    .077      5.1      16    18.6     21    16.0
3 10 HG         94    .130  12.86    3517    13.092   13427       104     269    1198    .147     15.3      40   176.0     52    10.0
4 16 HG         56    .160  12.32    1240    12.540    8119        39     209     267    .077      3.0      16    20.5     21    16.0
5 19 HG         37    .110  12.20     358    12.350    5761        19     104      55    .057      1.1       6     3.2      4    19.0
6 16 HG         56    .210  12.32    1242    12.590    8119        39     274     266    .077      3.0      21    20.5     21    16.0
7  3 HG         47    .740  12.59    1707    13.381   18462        70    2062     782    .113      7.9     233    88.4     75     3.0
8 16 HG         47    .170  12.48    1446    12.701    8119        32     220     307    .077      2.5      17    23.6     21    16.0
9 C.T.        2340    .390   7.51      76    10.427    1361       330     103       3    .143     47.2      15      .5      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        4.0      21    15.5
1 IDLE         166   2.250  11.44     110    13.869    1542        20     505       4    .232      4.6     117      .9      0    19.0
2 16 HG         75    .170  12.32    1222    12.571    8119        52     222     262    .077      4.0      17    20.2     21    16.0
3 10 HG         94    .140  12.99    3651    13.232   13427       103     287    1230    .147     15.1      42   180.8     52    10.0
4 16 HG         51    .170  12.46    1389    12.685    8119        35     220     295    .077      2.7      17    22.7     21    16.0
5 19 HG         37    .100  12.20     385    12.340    5761        19      94      60    .057      1.1       5     3.4      4    19.0
6 16 HG         51    .170  12.32    1332    12.545    8119        36     222     286    .077      2.7      17    22.0     21    16.0
7  3 HG         56    .710  12.59    1728    13.360   18462        84    1982     793    .113      9.4     224    89.6     75     3.0
8 16 HG         47    .610  12.46    1351    13.121    8119        31     762     278    .077      2.4      59    21.4     21    16.0
9 C.T.        2297    .290   7.60      73    10.371    1361       326      77       3    .143     46.6      11      .5      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        3.9      22    15.9
1 IDLE         202   3.050  11.57     123    14.838    1542        23     640       4    .232      5.3     149     1.0      0    19.0
2 16 HG         79    .170  12.48    1384    12.735    8119        54     219     294    .077      4.2      17    22.6     21    16.0
3 10 HG         94    .150  12.86    3825    13.112   13427       104     310    1300    .147     15.3      46   191.2     52    10.0
4 16 HG         61    .180  12.48    1384    12.726    8119        42     232     294    .077      3.2      18    22.7     21    16.0
5 19 HG         47    .110  12.20     427    12.361    5761        24     104      66    .057      1.3       6     3.8      4    19.0
6 16 HG         56    .170  12.48    1504    12.710    8119        39     219     319    .077      3.0      17    24.6     21    16.0
7  3 HG         51    .680  12.59    1792    13.325   18462        76    1903     824    .113      8.6     215    93.1     75     3.0
8 16 HG         47    .190  12.59    1466    12.831    8119        32     243     308    .077      2.5      19    23.7     21    16.0
9 C.T.        2254    .340   7.87      85    10.694    1361       311      88       4    .143     44.5      13      .5      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        3.9      22    16.9
1 IDLE         202   3.050  11.57     123    14.838    1542        23     640       4    .232      5.3     149     1.0      0    19.0
2 16 HG         79    .180  12.48    1505    12.745    8119        54     232     318    .077      4.2      18    24.5     21    16.0
3 10 HG         94    .150  12.86    3825    13.112   13427       104     310    1300    .147     15.3      46   191.2     52    10.0
4 16 HG         56    .160  12.48    1505    12.700    8119        39     207     319    .077      3.0      16    24.6     21    16.0
5 19 HG         47    .100  12.20     413    12.351    5761        24      94      64    .057      1.3       5     3.6      4    19.0
6 16 HG         56    .160  12.32    1427    12.540    8119        39     209     307    .077      3.0      16    23.6     21    16.0
7  3 HG         46    .720  12.59    1755    13.360   18462        69    2010     805    .113      7.8     227    91.0     75     3.0
8 16 HG         42    .180  12.48    1485    12.705    8119        29     232     315    .077      2.2      18    24.3     21    16.0
9 C.T.        2211    .350   7.69      85    10.428    1361       312      92       4    .143     44.6      13      .5      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        3.8      22    16.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------        3.9      22    15.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------        3.8      22    16.9
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.9) + 0.65(     3.8) =    3.873   GM/BHP HR
                                        CO- NDIR 0.35(    21.8) + 0.65(    22.1) =   22.027   GM/BHP HR
                                        NO2-NDIR 0.35(    15.7) + 0.65(    16.9) =   16.486   GM/BHP HR
                                                              CORRECTED NO2 =   16.961   GM/BHP HR
                                                                       BSFC =     .723   LB/BHP HR
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              CONCENTRATION AS MEASURED       TOTAL    FUEL        CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO    CO2   NO-CL     CARBON   CONS.       HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL     HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        3290   2.250  11.44      38    14.019    1542        36     500       1    .232      8.4     116      .3      0    19.0
2 16 HG       1092    .160  12.20    1087    12.469    8119        71     210     235    .077      5.5      16    18.1     21    16.0
3 10 HG       1635    .130  12.86    3600    13.154   13427       167     268    1220    .147     24.5      39   179.3     52    10.0
4 16 HG        848    .160  12.32    1187    12.565    8119        55     209     255    .077      4.2      16    19.6     21    16.0
5 19 HG        446    .110  12.20     325    12.355    5761        21     104      50    .057      1.2       6     2.9      4    19.0
6 16 HG        781    .210  12.32    1212    12.608    8119        50     273     259    .077      3.9      21    20.0     21    16.0
7  3 HG        831    .740  12.59    1675    13.413   18462       114    2057     765    .113     12.9     232    86.5     75     3.0
8 16 HG        693    .170  12.48    1400    12.719    8119        44     219     297    .077      3.4      17    22.8     21    16.0
9 C.T.       27041    .390   7.51      18    10.604    1361       347     101       1    .143     49.6      14      .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        5.0      21    15.4
1 IDLE        3290   2.250  11.44      38    14.019    1542        36     500       1    .232      8.4     116      .3      0    19.0
2 16 HG       1026    .170  12.32    1200    12.593    8119        66     221     257    .077      5.1      17    19.8     21    16.0
3 10 HG       1660    .140  12.99    3750    13.296   13427       168     286    1257    .147     24.6      42   184.8     52    10.0
4 16 HG        804    .170  12.46    1391    12.710    8119        51     219     295    .077      4.0      17    22.7     21    16.0
5 19 HG        401    .100  12.20     350    12.340    5761        19      94      54    .057      1.1       5     3.1      4    19.0
6 16 HG        759    .170  12.32    1317    12.566    8119        49     222     283    .077      3.8      17    21.8     21    16.0
7  3 HG        764    .710  12.59    1687    13.376   18462       105    1979     773    .113     11.9     224    87.4     75     3.0
8 16 HG        628    .610  12.46    1350    13.133    8119        39     762     277    .077      3.0      59    21.3     21    16.0
9 C.T.       25215    .290   7.60      18    10.412    1361       330      77       1    .143     47.1      11      .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        4.8      22    15.9
1 IDLE        4041   3.050  11.57      50    15.024    1542        41     632       2    .232      9.6     147      .4      0    19.0
2 16 HG       1072    .170  12.48    1375    12.757    8119        68     219     291    .077      5.3      17    22.4     21    16.0
3 10 HG       1624    .150  12.86    3925    13.172   13427       166     309    1328    .147     24.4      45   195.3     52    10.0
4 16 HG        804    .180  12.48    1375    12.740    8119        51     232     291    .077      3.9      18    22.4     21    16.0
5 19 HG        401    .110  12.20     388    12.350    5761        19     104      60    .057      1.1       6     3.4      4    19.0
6 16 HG        804    .170  12.48    1455    12.730    8119        51     219     308    .077      3.9      17    23.7     21    16.0
7  3 HG        741    .680  12.59    1712    13.344   18462       103    1900     786    .113     11.6     215    88.9     75     3.0
8 16 HG        649    .190  12.59    1425    12.845    8119        41     243     299    .077      3.2      19    23.0     21    16.0
9 C.T.       24671    .340   7.87      18    10.677    1361       314      88       1    .143     45.0      13      .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        4.8      22    16.7
1 IDLE        4041   3.050  11.57      50    15.024    1542        41     632       2    .232      9.6     147      .4      0    19.0
2 16 HG       1078    .180  12.48    1475    12.768    8119        69     231     311    .077      5.3      18    24.0     21    16.0
3 10 HG       1681    .150  12.86    4000    13.178   13427       171     309    1353    .147     25.2      45   198.9     52    10.0
4 16 HG        804    .160  12.48    1475    12.720    8119        51     206     313    .077      4.0      16    24.1     21    16.0
5 19 HG        356    .100  12.20     375    12.336    5761        17      94      58    .057       .9       5     3.3      4    19.0
6 16 HG        758    .160  12.32    1400    12.556    8119        49     209     301    .077      3.8      16    23.1     21    16.0
7  3 HG        741    .720  12.59    1730    13.384   18462       102    2006     792    .113     11.6     227    89.5     75     3.0
8 16 HG        626    .180  12.48    1450    12.723    8119        40     232     307    .077      3.1      18    23.7     21    16.0
9 C.T.       24496    .350   7.69      18    10.490    1361       318      92       1    .143     45.4      13      .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------        4.8      22    17.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------        4.9      22    15.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------        4.8      22    16.9
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.9) + 0.65(     4.8) =    4.818   GM/BHP HR
                                        CO- NDIR 0.35(    21.7) + 0.65(    22.0) =   21.921   GM/BHP HR
                                        NO2-CL   0.35(    15.7) + 0.65(    16.9) =   16.454   GM/BHP HR
                                                              CORRECTED NO2 =   16.928   GM/BHP HR
                                                                       BSFC =     .723   LB/BHP HR
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                         TABLE B-5. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-1   TEST-5  RUN-2     EGR-AIR-CAT.           04-12-73      K =1.008       HUM = 77.8  GR/LB
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             CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.         WEIGHTED GM/HR              MAN.
MODE         HC       CO     CO2     NO    CARBON   CONS.      HC       CO      NO2    FACT.    HC         CO     NO2     HP     VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE        45     .010    9.73     48    9.769    2091      10        4        3    .232     2.4         1      .8     0     19.0
2 16 HG       43     .020   10.93    830   10.996    8528      36       31      219    .077     2.8         2    16.9    21     16.0
3 10 HG       48     .020   11.94   1011   11.518   10524      47       37      307    .147     7.0         5    45.1    45     10.0
4 16 HG       39     .010   10.28    862   10.387    8528      30       17      236    .077     2.3         1    18.2    21     16.0
5 19 HG       29     .010    9.42    264    9.461    5988      20       13       55    .057     1.1         1     3.2     9     19.0
6 16 HG       34     .010   10.39   1000   10.437    8528      30       17      271    .077     2.3         1    20.9    21     16.0
7  3 HG       34     .060   12.59    995   12.687   17917      52      171      467    .113     5.9        19    52.7    67      3.0
8 16 HG       35     .010   10.50   1011   10.548    8528      31       16      271    .077     2.4         1    20.9    21     16.0
9 C.T.        41     .120    9.54     60    9.704    1501      14       77        6    .143     2.0        11      .9     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     1.4         2     8.6
1 IDLE        45     .010    9.73     48    9.769    2091      10        4        3    .232     2.4         1      .8     0     19.0
2 16 HG       53     .030   10.50    982   10.587    8528      46       49      263    .077     3.6         4    20.2    21     16.0
3 10 HG       39     .030   11.57    862   11.637   10524      33       55      259    .147     4.9         8    38.0    45     10.0
4 16 HG       39     .020   10.39    978   10.447    8528      30       33      265    .077     2.3         3    20.4    21     16.0
5 19 HG       31     .010    9.48    290    9.523    5988      21       13       61    .057     1.2         1     3.5     9     19.0
6 16 HG       39     .010   10.39   1063   10.492    8528      34       16      288    .077     2.6         1    22.2    21     16.0
7  3 HG       39     .050   12.72    944   12.807   17917      51      141      438    .113     5.8        16    49.5    67      3.0
8 16 HG       34     .010   10.50   1150   10.597    8528      30       16      309    .077     2.3         1    23.8    21     16.0
9 C.T.       924     .100    9.41     73    5.508    1501     272       55        7    .143    38.9         8      .9     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.1         2     8.6
1 IDLE        43     .010    9.95     60   10.006    2091      10        4        4    .232     2.3         1     1.0     0     19.0
2 16 HG       43     .020   10.62   1028   10.686    8528      37       32      272    .077     2.9         2    21.0    21     16.0
3 10 HG       43     .030   11.94    985   11.516   10524      42       55      299    .147     6.2         8    43.9    45     10.0
4 16 HG       40     .010   12.91   1115   12.963    8528      28       13      244    .077     2.2         1    18.8    21     16.0
5 19 HG       25     .010    9.48    304    9.517    5988      17       13       64    .057     1.0         1     3.6     9     19.0
6 16 HG       34     .010   10.39    995   10.437    8528      30       17      270    .077     2.3         1    20.8    21     16.0
7  3 HG       34     .050   12.72    920   12.807   17917      51      141      427    .113     5.8        16    48.3    67      3.0
8 16 HG       29     .010   10.55   1203   10.591    8528      25       16      322    .077     1.9         1    24.8    21     16.0
9 C.T.       846     .120    9.41     60    5.444    1501     252       67        5    .143    36.0        10      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.9         2     8.8
1 IDLE        43     .010    9.95     60   10.006    2091      10        4        4    .232     2.3         1     1.0     0     19.0
2 16 HG       48     .020   10.50   1046   10.572    8528      42       33      280    .077     3.2         3    21.6    21     16.0
3 10 HG       49     .030   11.57   1080   11.653   10524      48       55      324    .147     7.0         8    47.6    45     10.0
4 16 HG       43     .010   10.50   1080   10.556    8528      38       16      290    .077     2.9         1    22.3    21     16.0
5 19 HG       29     .010    9.48    317    9.521    5988      20       13       66    .057     1.1         1     3.8     9     19.0
6 16 HG       34     .010   10.39   1050   10.492    8528      34       16      285    .077     2.6         1    21.9    21     16.0
7  3 HG       29     .050   12.72    911   12.801   17917      44      141      428    .113     5.0        16    47.8    67      3.0
8 16 HG       29     .010   10.62     73   10.661    8528      25       16       19    .077     1.9         1     1.5    21     16.0
9 C.T.       769     .110    9.54     73    5.481    1501     227       61        7    .143    32.5         9      .9     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.8         2     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     2.2         2     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     2.9         2     8.4
FOUR CYCLE COMPOSITE -                       HC- NDIR 0.35(     2.2) + 0.65(     2.9) =     2.637   GM/BHP HR
                                             CO- NDIR 0.35(     2.1) + 0.65(     2.0) =     2.008   GM/BHP HR
                                             NO2-NDIR 0.35(     8.6) + 0.65(     8.4) =     8.504   GM/BHP HR
                                                                     CORRECTED NO2 =     8.575   GM/BHP HR
                                                                              BSFC =      .767   LB/BHP HR


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             CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.         WEIGHTED GM/HR              MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC       CO      NO2    FACT.  HC-FID       CO   NO2-CL   HP     VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE       339     .010    9.73     38    9.774    2091       7        4        3    .232     1.7         1      .6     0     19.0
2 16 HG      446     .020   10.93    788   10.995    8528      35       31      203    .077     2.7         2    15.6    21     16.0
3 10 HG      581     .020   11.94    990   11.518   10524      53       37      300    .147     7.8         5    44.1    45     10.0
4 16 HG      345     .010   10.28    843   10.324    8528      28       17      231    .077     2.2         1    17.8    21     16.0
5 19 HG      239     .010    9.42    250    9.454    5988      15       13       53    .057      .9         1     3.0     9     19.0
6 16 HG      395     .010   10.39   1000   10.439    8528      32       17      271    .077     2.5         1    20.9    21     16.0
7  3 HG      262     .060   12.59    938   12.676   17917      37      171      440    .113     4.2        19    49.7    67      3.0
8 16 HG      274     .010   10.50    975   10.537    8528      22       16      262    .077     1.7         1    20.2    21     16.0
9 C.T.      4179     .120    9.54     75    5.578    1501     247       65        7    .143    35.3         9     1.0     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.8         2     8.3
1 IDLE       338     .010    9.73     38    9.774    2091       7        4        3    .232     1.7         1      .6     0     19.0
2 16 HG      472     .030   10.50    963   10.577    8528      38       49      258    .077     2.9         4    19.8    21     16.0
3 10 HG      526     .030   11.57    825   11.653   10524      48       55      247    .147     7.0         8    36.4    45     10.0
4 16 HG      334     .020   10.39    955   10.443    8528      27       33      259    .077     2.1         3    19.9    21     16.0
5 19 HG      239     .010    9.48    275    9.514    5988      15       13       57    .057      .9         1     3.3     9     19.0
6 16 HG      340     .010   10.39   1037   10.434    8528      28       17      281    .077     2.1         1    21.7    21     16.0
7  3 HG      196     .050   12.72    906   12.790   17917      27      141      421    .113     3.1        16    47.6    67      3.0
8 16 HG      241     .010   10.50   1112   10.534    8528      20       16      299    .077     1.5         1    23.0    21     16.0
9 C.T.      8125     .100    9.41     75    5.383    1501     229       57        7    .143    32.8         8     1.0     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.6         2     8.3
1 IDLE       426     .010    9.95     38   10.003    2091       9        4        3    .232     2.1         1      .6     0     19.0
2 16 HG      439     .020   10.62   1020   10.684    8528      35       32      270    .077     2.7         2    20.8    21     16.0
3 10 HG      536     .030   11.94    963   11.524   10524      49       55      292    .147     7.2         8    42.9    45     10.0
4 16 HG      353     .010   12.91   1075   12.955    8528      23       13      235    .077     1.8         1    18.1    21     16.0
5 19 HG      234     .010    9.48    287    9.519    5988      15       13       60    .057      .9         1     3.4     9     19.0
6 16 HG      334     .010   10.39   1000   10.433    8528      27       17      271    .077     2.1         1    20.9    21     16.0
7  3 HG      207     .050   12.72    875   12.791   17917      29      141      407    .113     3.3        16    46.0    67      3.0
8 16 HG      236     .010   10.55   1200   10.584    8528      19       16      321    .077     1.5         1    24.7    21     16.0
9 C.T.      7918     .120    9.41     50    5.322    1501     223       68        5    .143    31.9        10      .7     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.6         2     8.6
1 IDLE       426     .010    9.95     38   10.003    2091       9        4        3    .232     2.1         1      .6     0     19.0
2 16 HG      450     .020   10.50   1030   10.565    8528      36       33      276    .077     2.8         3    21.3    21     16.0
3 10 HG      543     .030   11.57   1030   11.654   10524      49       55      309    .147     7.2         8    45.4    45     10.0
4 16 HG      324     .010   10.50   1055   10.543    8528      27       16      283    .077     2.1         1    21.8    21     16.0
5 19 HG      234     .010    9.48    287    9.513    5988      15       13       60    .057      .8         1     3.4     9     19.0
6 16 HG      323     .010   10.39   1025   10.432    8528      26       17      278    .077     2.0         1    21.4    21     16.0
7  3 HG      212     .050   12.72    850   12.791   17917      30      141      395    .113     3.4        16    44.7    67      3.0
8 16 HG      231     .010   10.62   1175   10.653    8528      18       16      312    .077     1.4         1    24.0    21     16.0
9 C.T.      8135     .110    9.54     50    5.464    1501     224       61        5    .143    32.0         9      .7     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.6         2     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     2.7         2     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     2.6         2     8.7
FOUR CYCLE COMPOSITE -                       HC- FID  0.35(     2.7) + 0.65(     2.6) =     2.624   GM/BHP HR
                                             CO- NDIR 0.35(     2.0) + 0.65(     2.0) =     2.001   GM/BHP HR
                                             NO2-CL   0.35(     8.3) + 0.65(     8.7) =     8.560   GM/BHP HR
                                                                     CORRECTED NO2 =     8.631   GM/BHP HR
                                                                              BSFC =      .767   LB/BHP HR
                         TABLE B-6.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-1    TEST-5  RUN-3     EGR-AIR-CAT.          04-12-73        K =1.008      HUM = 77.8  GR/LB
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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR          WT.        WEIGHTED GM/HR           MAN.
               HC      CO     CO2      NO   CARBON    CONS.       HC       CO      NO2    FACT.    HC        CO     NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         47    .010   10.22      48   10.281    2091        10        4        3    .232     2.4        1      .8     0   19.0
2 16 HG        59    .020   10.22     819   10.298    8528        48       33      224    .077     3.7        3    17.2    21   16.0
3 10 HG        41    .020   11.38     846   11.444   10524        41       37      258    .147     6.0        5    38.0    95   10.0
4 16 HG        37    .030   10.28     870   10.350    8528        33       50      238    .077     2.5        4    18.3    21   16.0
5 19 HG        32    .010    9.21     256    9.255    5988        22       13       55    .057     1.3        1     3.1     9   19.0
6 16 HG        37    .010   10.28     895   10.330    8528        33       17      245    .077     2.5        1    18.9    21   16.0
7  3 HG        37    .060   12.52     862   12.620   17917        57      172      406    .113     6.4       19    45.9    67    3.0
8 16 HG        37    .020   10.49    1037   10.550    8528        32       33      278    .077     2.5        3    21.4    21   16.0
9 C.T.        826    .080    9.18      60    5.152    1501       260       47        6    .143    37.2        7      .8     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.1        2     7.9
1 IDLE         47    .010   10.22      48   10.281    2091        10        4        3    .232     2.4        1      .8     0   19.0
2 16 HG        46    .030   10.33     961   10.410    8528        41       50      261    .077     3.1        4    20.1    21   16.0
3 10 HG        46    .030   11.44     903   11.520   10524        45       55      274    .147     6.7        8    40.3    95   10.0
4 16 HG        41    .020   10.28    1011   10.349    8528        37       33      277    .077     2.8        3    21.3    21   16.0
5 19 HG        37    .010    9.37     290    9.420    5988        25       13       61    .057     1.4        1     3.5     9   19.0
6 16 HG        35    .010    9.33    1045    9.378    8528        34       18      316    .077     2.6        1    24.3    21   16.0
7  3 HG        29    .050   12.65     878   12.731   17917        44      142      410    .113     5.0       16    46.4    67    3.0
8 16 HG        37    .010   10.50    1114   10.550    8528        32       16      299    .077     2.5        1    23.0    21   16.0
9 C.T.        810    .080    9.28      53    5.235    1501       251       46        5    .143    35.9        7      .7     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.0        2     8.7
1 IDLE         47    .010    9.95      48   10.011    2091        11        4        3    .232     2.5        1      .8     0   19.0
2 16 HG        44    .020   10.33     911   10.398    8528        39       33      248    .077     3.0        3    19.1    21   16.0
3 10 HG        46    .030   11.44     944   11.520   10524        45       55      286    .147     6.7        8    42.1    95   10.0
4 16 HG        45    .020   10.22    1045   10.289    8528        40       33      288    .077     3.1        3    22.1    21   16.0
5 19 HG        37    .010    9.21     263    9.260    5988        26       13       56    .057     1.5        1     3.2     9   19.0
6 16 HG        41    .010   10.17    1080   10.224    8528        37       17      299    .077     2.8        1    23.0    21   16.0
7  3 HG        37    .050   12.32     878   12.410   17917        58      146      421    .113     6.5       16    47.6    67    3.0
8 16 HG        37    .010   10.33    1167   10.380    8528        33       17      318    .077     2.5        1    24.5    21   16.0
9 C.T.        812    .070    9.51      63    5.457    1501       241       39        6    .143    34.5        6      .8     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.0        2     8.8
1 IDLE         47    .010    9.95      48   10.011    2091        11        4        3    .232     2.5        1      .8     0   19.0
2 16 HG        55    .020   10.22    1011   10.299    8528        49       33      278    .077     3.8        3    21.4    21   16.0
3 10 HG        51    .030   11.32    1148   11.405   10524        51       56      352    .147     7.5        8    51.7    95   10.0
4 16 HG        47    .010   10.17    1080   10.231    8528        42       17      299    .077     3.3        1    23.0    21   16.0
5 19 HG        44    .010    9.21     260    9.268    5988        31       13       56    .057     1.8        1     3.2     9   19.0
6 16 HG        37    .020   10.22    1080   10.280    8528        33       34      297    .077     2.6        3    22.9    21   16.0
7  3 HG        35    .050   12.51     862   12.598   17917        54      144      407    .113     6.1       16    46.0    67    3.0
8 16 HG        37    .010   10.33    1132   10.380    8528        33       17      309    .077     2.5        1    23.8    21   16.0
9 C.T.        808    .060    9.51      61    5.443    1501       241       33        6    .143    34.4        5      .8     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.1        2     9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     3.1        2     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     3.1        2     9.1
FOUR CYCLE COMPOSITE -                HC- NDIR 0.35(      3.1) + 0.65(      3.1) =    3.058   GM/BHP HR
                                      CO- NDIR 0.35(      2.0) + 0.65(      1.9) =    1.939   GM/BHP HR
                                      NO2-NDIR 0.35(      8.3) + 0.65(      9.1) =    8.787   GM/BHP HR
                                                              CORRECTED NO2 =    8.861   GM/BHP HR
                                                                       BSFC =     .767   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR          WT.        WEIGHTED GM/HR           MAN.
             HC-FID    CO     CO2   NO-CL   CARBON    CONS.       HC       CO      NO2    FACT.  HC-FID      CO   NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE        328    .010   10.22      37   10.263    2091         7        4        3    .232     1.6        1      .6     0   19.0
2 16 HG       394    .020   10.22     781   10.279    8528        33       34      215    .077     2.5        3    16.6    21   16.0
3 10 HG       509    .020   11.38     850   11.451   10524        47       37      259    .147     6.9        5    38.1    95   10.0
4 16 HG       329    .030   10.28     850   10.393    8528        27       50      233    .077     2.1        4    17.9    21   16.0
5 19 HG       206    .010    9.21     230    9.291    5988        13       13       49    .057      .8        1     2.8     9   19.0
6 16 HG       310    .010   10.28     875   10.321    8528        26       17      240    .077     2.0        1    18.5    21   16.0
7  3 HG       239    .060   12.52     825   12.603   17917        33      172      389    .113     3.8       19    44.0    67    3.0
8 16 HG       219    .020   10.49    1025   10.532    8528        18       33      276    .077     1.4        3    21.2    21   16.0
9 C.T.      10186    .080    9.18      67    5.279    1501       290       46        6    .143    41.4        7      .9     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.0        2     7.7
1 IDLE        328    .010   10.22      37   10.263    2091         7        4        3    .232     1.6        1      .6     0   19.0
2 16 HG       427    .030   10.33     955   10.403    8528        35       50      260    .077     2.7        4    20.0    21   16.0
3 10 HG       520    .030   11.44     875   11.522   10524        47       55      265    .147     7.0        8    39.0    95   10.0
4 16 HG       329    .020   10.28     987   10.333    8528        27       33      270    .077     2.1        3    20.8    21   16.0
5 19 HG       217    .010    9.37     270    9.402    5988        14       13       57    .057      .8        1     3.3     9   19.0
6 16 HG       326    .010    9.33    1025    9.373    8528        30       18      310    .077     2.3        1    23.8    21   16.0
7  3 HG       184    .050   12.65     843   12.718   17917        26      142      394    .113     2.9       16    44.6    67    3.0
8 16 HG       223    .010   10.50    1087   10.532    8528        18       16      292    .077     1.4        1    22.5    21   16.0
9 C.T.       9155    .080    9.28      70    5.275    1501       260       45        7    .143    37.2        7      .9     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.8        2     8.4
1 IDLE        320    .010    9.95      37    9.992    2091         7        4        3    .232     1.6        1      .6     0   19.0
2 16 HG       422    .020   10.33     905   10.392    8528        35       33      247    .077     2.7        3    19.0    21   16.0
3 10 HG       536    .030   11.44     975   11.624   10524        49       55      296    .147     7.2        8    43.5    95   10.0
4 16 HG       328    .020   10.22    1055   10.273    8528        27       34      291    .077     2.1        3    22.4    21   16.0
5 19 HG       217    .010    9.21     262    9.242    5988        14       13       56    .057      .8        1     3.2     9   19.0
6 16 HG       324    .010   10.17    1055   10.213    8528        27       17      292    .077     2.1        1    22.5    21   16.0
7  3 HG       201    .050   12.32     858   12.390   17917        29      196      412    .113     3.3       17    46.5    67    3.0
8 16 HG       230    .010   10.33    1155   10.363    8528        19       17      316    .077     1.5        1    24.3    21   16.0
9 C.T.       9590    .070    9.51      62    5.539    1501       260       38        6    .143    37.2        5      .8     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.8        2     8.8
1 IDLE        320    .010    9.95      37    9.992    2091         7        4        3    .232     1.6        1      .6     0   19.0
2 16 HG       438    .020   10.22    1018   10.284    8528        36       34      280    .077     2.8        3    21.6    21   16.0
3 10 HG       530    .030   11.32    1125   11.403   10524        49       56      345    .147     7.2        8    50.7    95   10.0
4 16 HG       328    .010   10.17    1055   10.213    8528        27       17      292    .077     2.1        1    22.5    21   16.0
5 19 HG       217    .010    9.21     256    9.242    5988        14       13       55    .057      .8        1     3.1     9   19.0
6 16 HG       328    .020   10.22    1087   10.273    8528        27       34      300    .077     2.1        3    23.1    21   16.0
7  3 HG       173    .050   12.51     843   12.577   17917        25      144      399    .113     2.8       16    45.1    67    3.0
8 16 HG       217    .010   10.33    1118   10.362    8528        18       17      305    .077     1.4        1    23.5    21   16.0
9 C.T.       8464    .060    9.51      68    5.466    1501       246       33        6    .143    35.2        5      .9     0   29.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.7        2     9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     2.9        2     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     2.7        2     9.0
FOUR CYCLE COMPOSITE -                HC- FID  0.35(      2.9) + 0.65(      2.7) =    2.747   GM/BHP HR
                                      CO- NDIR 0.35(      2.0) + 0.65(      1.9) =    1.938   GM/BHP HR
                                      NO2-CL   0.35(      8.1) + 0.65(      9.0) =    8.669   GM/BHP HR
                                                              CORRECTED NO2 =    8.791   GM/BHP HR
                                                                       BSFC =     .767   LB/BHP HR
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                           TABLE B-7. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-1   TEST-5  RUN-4    EGR-AIR-CAT.            04-13-73      K =1.008     HUM = 77.8  GR/LB
-----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2     NO   CARBON   CONS.      HC     CO    NO2    FACT.    HC         CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         52    .010    9.89     60    9.956    2091      12      4      4    .232    2.7         1    1.0     0    19.0
2 16 HG        43    .020   10.17    767   10.236    8528      39     34    212    .077    3.0         3   16.3    21    16.0
3 10 HG        36    .020   11.32    720   11.379   10529      36     37    221    .147    5.3         5   32.5    45    10.0
4 16 HG        35    .010   10.22    846   10.268    8528      31     17    233    .077    2.4         1   18.0    21    16.0
5 19 HG        27    .010    9.32    263    9.359    5988      19     13     56    .057    1.1         1    3.2     4    19.0
6 16 HG        23    .020   10.28    862   10.325    8528      21     33    236    .077    1.6         3   18.2    21    16.0
7  3 HG        27    .060   12.59    846   12.679   17917      41    171    397    .113    4.7        19   44.8    67     3.0
8 16 HG        23    .020   10.39    911   10.435    8528      20     33    247    .077    1.6         3   19.0    21    16.0
9 C.T.        750    .110    4.74    122    5.660    1501     215     59     11    .143   30.7         8    1.5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.5         2    7.4
1 IDLE         52    .010    9.89     60    9.956    2091      12      4      4    .232    2.7         1    1.0     0    19.0
2 16 HG        41    .020   10.28    911   10.344    8528      37     33    249    .077    2.8         3   19.2    21    16.0
3 10 HG        37    .030   11.32    878   11.390   10529      37     56    269    .147    5.4         8   39.6    45    10.0
4 16 HG        35    .020   10.28    977   10.338    8528      31     33    268    .077    2.4         3   20.6    21    16.0
5 19 HG        23    .010    9.27    267    9.305    5988      16     13     57    .057     .9         1    3.3     4    19.0
6 16 HG        37    .020   10.28    994   10.340    8528      33     33    272    .077    2.5         3   21.0    21    16.0
7  3 HG        27    .050   12.52    878   12.599   17917      41    144    415    .113    4.7        16   46.8    67     3.0
8 16 HG        27    .010   10.50   1132   10.539    8528      24     16    304    .077    1.8         1   23.4    21    16.0
9 C.T.        732    .090    4.52     70    5.401    1501     220     51      6    .143   31.4         7     .9     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.6         2    8.4
1 IDLE         67    .010    9.84     67    9.922    2091      15      4      5    .232    3.5         1    1.1     0    19.0
2 16 HG        51    .030   10.39    977   10.475    8528      45     49    264    .077    3.5         4   20.3    21    16.0
3 10 HG        44    .030   11.32   1011   11.398   10529      44     56    310    .147    6.5         8   45.6    45    10.0
4 16 HG        33    .010   10.28    944   10.326    8528      29     17    259    .077    2.3         1   19.9    21    16.0
5 19 HG        31    .030    9.26    290    9.323    5988      22     39     62    .057    1.2         2    3.5     4    19.0
6 16 HG        37    .010   10.28    977   10.330    8528      33     17    268    .077    2.5         1   20.6    21    16.0
7  3 HG        27    .050   12.51    977   12.589   17917      42    144    462    .113    4.7        16   52.2    67     3.0
8 16 HG        28    .010   10.33   1062   10.370    8528      25     17    290    .077    1.9         1   22.3    21    16.0
9 C.T.        780    .110    4.46     76    5.412    1501     234     62      7    .143   33.4         9    1.0     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.9         2    9.0
1 IDLE         67    .010    9.84     48    9.922    2091      15      4      3    .232    3.5         1     .8     0    19.0
2 16 HG        46    .010   10.28    927   10.340    8528      41     17    254    .077    3.2         1   19.5    21    16.0
3 10 HG        45    .020   11.38    927   11.449   10529      45     37    283    .147    6.6         5   41.6    45    10.0
4 16 HG        46    .010   10.28    977   10.340    8528      41     17    268    .077    3.2         1   20.6    21    16.0
5 19 HG        32    .010    9.26    303    9.305    5988      22     13     65    .057    1.3         1    3.7     4    19.0
6 16 HG        37    .010   10.28    977   10.330    8528      33     17    268    .077    2.5         1   20.6    21    16.0
7  3 HG        26    .060   12.72    751   12.808   17917      39    170    349    .113    4.4        19   39.4    67     3.0
8 16 HG        32    .010   10.90   1465   10.945    8528      27     16    379    .077    2.1         1   29.2    21    16.0
9 C.T.        905    .030    5.41     82    6.417    1501     229     14      6    .143   32.7         2     .9     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.9         2    8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    2.6         2    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    2.9         2    8.7
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(    2.6) + 0.65(    2.9) =    2.769   GM/BHP HR
                                       CO- NDIR 0.35(    2.1) + 0.65(    1.9) =    1.938   GM/BHP HR
                                       NO2-NDIR 0.35(    7.4) + 0.65(    8.7) =    8.448   GM/BHP HR
                                                           CORRECTED NO2 =    8.519   GM/BHP HR
                                                                    BSFC =     .767   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE         HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC     CO    NO2    FACT.  HC-FID       CO  NO2-CL  HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE        393    .010    9.89     31    9.939    2091       8      4      2    .232    1.9         1     .5     0    19.0
2 16 HG       295    .020   10.17    787   10.218    8528      24     34    218    .077    1.8         3   16.8    21    16.0
3 10 HG       398    .020   11.32    690   11.380   10529      37     37    212    .147    5.4         5   31.1    45    10.0
4 16 HG       208    .010   10.22    891   10.251    8528      17     17    230    .077    1.3         1   17.7    21    16.0
5 19 HG       109    .010    9.32    241    9.341    5988       7     13     51    .057     .4         1    2.9     4    19.0
6 16 HG       219    .020   10.28    850   10.322    8528      18     33    233    .077    1.4         3   18.0    21    16.0
7  3 HG       120    .060   12.59    812   12.662   17917      17    172    381    .113    1.9        19   43.1    67     3.0
8 16 HG       150    .020   10.39    941   10.425    8528      12     33    256    .077     .9         3   19.7    21    16.0
9 C.T.       9404    .110    4.74     44    5.390    1501     244     58      4    .143   34.9         8     .5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.4         2    7.2
1 IDLE        393    .010    9.89     31    9.939    2091       8      4      2    .232    1.9         1     .5     0    19.0
2 16 HG       369    .020   10.28    925   10.337    8528      30     33    253    .077    2.3         3   19.5    21    16.0
3 10 HG       464    .030   11.32    875   11.396   10529      43     56    268    .147    6.3         8   39.4    45    10.0
4 16 HG       241    .020   10.28    992   10.324    8528      20     33    272    .077    1.5         3   20.9    21    16.0
5 19 HG       141    .010    9.27    262    9.294    5988       9     13     56    .057     .5         1    3.2     4    19.0
6 16 HG       263    .020   10.28   1000   10.326    8528      22     33    274    .077    1.7         3   21.1    21    16.0
7  3 HG        95    .050   12.52    845   12.579   17917      14    144    400    .113    1.5        16   45.2    67     3.0
8 16 HG       154    .010   10.50   1112   10.525    8528      12     16    299    .077    1.0         1   23.0    21    16.0
9 C.T.       9801    .090    4.52     46    5.590    1501     263     49      4    .143   37.6         7     .6     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.6         2    8.3
1 IDLE        647    .010    9.84     56    9.915    2091      14      4      4    .232    3.2         1     .9     0    19.0
2 16 HG       371    .030   10.39    981   10.457    8528      30     49    266    .077    2.3         4   20.5    21    16.0
3 10 HG       464    .030   11.32   1000   11.396   10529      43     56    307    .147    6.3         8   45.1    45    10.0
4 16 HG       241    .010   10.28    987   10.314    8528      20     17    271    .077    1.5         1   20.9    21    16.0
5 19 HG       130    .030    9.26    292    9.303    5988       8     39     62    .057     .5         2    3.6     4    19.0
6 16 HG       241    .010   10.28    975   10.314    8528      20     17    268    .077    1.5         1   20.6    21    16.0
7  3 HG        89    .050   12.51    956   12.569   17917      13    144    452    .113    1.4        16   51.1    67     3.0
8 16 HG       142    .010   10.33   1113   10.354    8528      12     17    304    .077     .9         1   23.4    21    16.0
9 C.T.       9589    .110    4.46     40    5.529    1501     260     60      4    .143   37.2         9     .5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.6         2    9.0
1 IDLE        647    .010    9.84     56    9.915    2091      14      4      4    .232    3.2         1     .9     0    19.0
2 16 HG      1013    .010   10.28    317   10.391    8528      83     17     86    .077    6.4         1    6.7    21    16.0
3 10 HG       442    .020   11.38    906   11.449   10529      41     37    277    .147    6.0         5   40.7    45    10.0
4 16 HG       230    .010   10.28    987   10.313    8528      19     17    271    .077    1.5         1   20.9    21    16.0
5 19 HG       130    .010    9.26    296    9.283    5988       8     13     63    .057     .5         1    3.6     4    19.0
6 16 HG       252    .010   10.28    987   10.315    8528      21     17    271    .077    1.6         1   20.9    21    16.0
7  3 HG        67    .060   12.72    737   12.787   17917       9    170    343    .113    1.1        19   38.7    67     3.0
8 16 HG       132    .010   10.90   1475   10.923    8528      10     16    382    .077     .8         1   29.4    21    16.0
9 C.T.       9053    .030    5.91     60    6.395    1501     214     14      5    .143   30.6         2     .7     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    2.5         2    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    2.5         2    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    2.6         2    8.4
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(    2.5) + 0.65(    2.6) =    2.542   GM/BHP HR
                                       CO- NDIR 0.35(    2.1) + 0.65(    1.9) =    1.934   GM/BHP HR
                                       NO2-CL   0.35(    7.8) + 0.65(    8.4) =    8.176   GM/BHP HR
                                                           CORRECTED NO2 =    8.244   GM/BHP HR
                                                                    BSFC =     .767   LB/BHP HR
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TABLE B-8. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 2-2   TEST-6  RUN-1    EGR-CAT.                04-13-73     K =1.031     HUM = 85.5  GR/LB
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                CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE             HC      CO     CO2      NO    CARBON    CONS.      HC      CO     NO2    FACT.    HC        CO     NO2     HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE          131    .420   11.81      97    12.371     1919      22     132       5    .232
2 16 HG          39    .030   12.99    1097    13.062     8401      27      39     234    .077     5.1       31     1.2      0    19.8
3 10 HG          37    .030   13.41     834    13.480    12256      36      55     251    .147     2.1        3    18.0     21    16.0
4 16 HG          30    .020   13.13    1239    13.182     8401      21      26     262    .077     5.3        8    36.8     45    10.0
5 19 HG          15    .010   12.79     394    12.816     6096       8      10      62    .057     1.6        2    20.2     21    16.0
6 16 HG          20    .020   12.99    1114    13.032     8401      14      26     238    .077      .4        1     3.6      6    19.0
7  3 HG          28    .250   13.91     950    14.190    17963      38     639     399    .113     1.1        2    18.4     21    16.0
8 16 HG          19    .030   13.41    1313    13.461     8401      13      38     272    .077     4.3       72    45.1     68     3.0
9 C.T.          735    .030    8.14      55     8.969     1560     138      11       3    .143     1.0        3    20.9     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    19.8        2      .5      0    24.5
1 IDLE          131    .420   11.81      97    12.371     1919      22     132       5    .232     1.9        6     7.8
2 16 HG          48    .030   13.27    1185    13.352     8401      33      38     248    .077     5.1       31     1.2      0    19.8
3 10 HG          47    .030   13.55     927    13.631    12256      46      54     277    .147     2.5        3    19.1     21    16.0
4 16 HG          37    .020   13.27    1313    13.330     8401      25      25     275    .077     6.7        8    40.7     45    10.0
5 19 HG          28    .010   12.72     344    12.760     6096      14      10      54    .057     1.9        2    21.2     21    16.0
6 16 HG          33    .020   13.27    1185    13.326     8401      22      25     248    .077      .8        1     3.1      6    19.0
7  3 HG          45    .260   13.98     911    14.289    17963      61     660     380    .113     1.7        2    19.1     21    16.0
8 16 HG          19    .020   13.41    1407    13.451     8401      13      25     292    .077     6.9       75    43.0     68     3.0
9 C.T.          710    .030    8.24      46     9.037     1560     132      10       3    .143     1.0        2    22.5     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    18.9        1      .4      0    24.5
1 IDLE          188    .750   12.59      97    13.543     1919      29     215       5    .232     2.2        6     8.0
2 16 HG          49    .020   13.27    1258    13.343     8401      33      25     263    .077     6.7       50     1.1      0    19.8
3 10 HG          47    .030   13.69     977    13.771    12256      45      54     289    .147     2.6        2    20.2     21    16.0
4 16 HG          37    .020   13.27    1276    13.330     8401      25      25     267    .077     6.6        8    42.4     45    10.0
5 19 HG          28    .010   12.86     394    12.900     6096      14       9      62    .057     1.9        2    20.6     21    16.0
6 16 HG          28    .020   13.27    1239    13.320     8401      19      25     259    .077      .8        1     3.5      6    19.0
7  3 HG          35    .240   13.98     961    14.258    17963      48     611     402    .113     1.5        2    20.0     21    16.0
8 16 HG          28    .010   13.41    1350    13.450     8401      19      13     280    .077     5.4       69    45.4     68     3.0
9 C.T.          703    .020    8.28      65     9.059     1560     131       7       4    .143     1.5        1    21.6     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    18.7        1      .5      0    24.5
1 IDLE          188    .750   12.59      97    13.543     1919      29     215       5    .232     2.2        6     8.3
2 16 HG          56    .020   13.27    1276    13.350     8401      38      25     267    .077     6.7       50     1.1      0    19.8
3 10 HG          51    .020   13.63    1114    13.705    12256      49      36     331    .147     2.9        2    20.5     21    16.0
4 16 HG          39    .010   13.27    1369    13.322     8401      27      13     287    .077     7.2        5    48.6     45    10.0
5 19 HG          35    .010   12.72     426    12.768     6096      18      10      67    .057     2.0        1    22.1     21    16.0
6 16 HG          37    .010   13.13    1320    13.180     8401      25      13     279    .077     1.0        1     3.8      6    19.0
7  3 HG          24    .260   13.84     927    14.126    17963      33     668     391    .113     2.0        1    21.5     21    16.0
8 16 HG          27    .010   13.37    1584    13.409     8401      18      13     329    .077     3.7       75    44.2     68     3.0
9 C.T.          712    .030    8.16      62     8.959     1560     134      11       4    .143     1.4        1    25.4     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    19.1        2      .5      0    24.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     2.2        7     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     2.0        6     7.9
FOUR CYCLE COMPOSITE -                                                                         2.2        6     8.6
                                     HC- NDIR 0.35(      2.0) + 0.65(      2.2) =     2.127   GM/BHP HR
                                     CO- NDIR 0.35(      5.8) + 0.65(      6.5) =     6.240   GM/BHP HR
                                     NO2-NDIR 0.35(      7.9) + 0.65(      8.6) =     8.358   GM/BHP HR
                                                              CORRECTED NO2 =     8.615   GM/BHP HR
                                                                       BSFC =      .776   LB/BHP HR


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                CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR                MAN.
MODE           HC-FID    CO     CO2   NO-CL    CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID      CO   NO2-CL    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE         2672    .420   11.81      75    12.497     1919      41     130       4    .232
2 16 HG         650    .030   12.99    1037    13.085     8401      42      39     221    .077     9.5       30      .9      0    19.8
3 10 HG         652    .030   13.41     800    13.505    12256      59      55     241    .147     3.2        3    17.0     21    16.0
4 16 HG         381    .020   13.13    1200    13.188     8401      24      26     254    .077     8.7        8    35.4     45    10.0
5 19 HG         291    .010   12.79     375    12.829     6096      14      10      59    .057     1.9        2    19.5     21    16.0
6 16 HG         291    .020   12.99    1087    13.039     8401      19      26     233    .077      .8        1     3.3      6    19.0
7  3 HG         498    .250   13.91     908    14.210    17963      63     638     381    .113     1.4        2    17.9     21    16.0
8 16 HG         360    .030   13.41    1308    13.476     8401      22      38     271    .077     7.1       72    43.1     68     3.0
9 C.T.         7314    .030    8.14      43     8.901     1560     128      11       3    .143     1.7        3    20.8     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    18.3        2      .4      0    24.5
1 IDLE         2672    .420   11.81      75    12.497     1919      41     130       4    .232     2.5        6     7.5
2 16 HG         584    .030   13.27    1175    13.358     8401      37      38     245    .077     9.5       30      .9      0    19.8
3 10 HG         608    .030   13.55     900    13.641    12256      55      54     268    .147     2.8        3    18.9     21    16.0
4 16 HG         404    .020   13.27    1225    13.330     8401      25      25     256    .077     8.0        8    39.5     45    10.0
5 19 HG         313    .010   12.72     337    12.761     6096      15      10      53    .057     2.0        2    19.7     21    16.0
6 16 HG         314    .020   13.27    1212    13.321     8401      20      25     254    .077      .8        1     3.0      6    19.0
7  3 HG         475    .260   13.98     900    14.288    17963      60     660     376    .113     1.5        2    19.5     21    16.0
8 16 HG         337    .020   13.41    1425    13.464     8401      21      25     295    .077     6.8       75    42.5     68     3.0
9 C.T.         7966    .030    8.24      58     9.067     1560     137      10       3    .143     1.6        2    22.7     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    19.6        1      .5      0    24.5
1 IDLE         3303    .750   12.59      50    13.670     1919      46     213       2    .232     2.5        6     7.9
2 16 HG         606    .020   13.27    1275    13.351     8401      38      25     266    .077    10.8       49      .5      0    19.8
3 10 HG         631    .030   13.69     975    13.783    12256      56      54     288    .147     2.9        2    20.5     21    16.0
4 16 HG         359    .020   13.27    1287    13.326     8401      23      25     269    .077     8.2        8    42.3     45    10.0
5 19 HG         313    .010   12.86     387    12.901     6096      15       9      60    .057     1.7        2    20.7     21    16.0
6 16 HG         314    .020   13.27    1266    13.321     8401      20      25     265    .077      .8        1     3.4      6    19.0
7  3 HG         362    .240   13.98     937    14.256    17963      46     611     392    .113     1.5        2    20.4     21    16.0
8 16 HG         337    .010   13.41    1375    13.454     8401      21      13     285    .077     5.2       69    44.3     68     3.0
9 C.T.         6461    .020    8.28      58     8.946     1560     113       7       3    .143     1.6        1    21.9     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    16.1        1      .5      0    24.5
1 IDLE         3303    .750   12.59      50    13.670     1919      46     213       2    .232     2.3        6     8.3
2 16 HG         606    .020   13.27    1275    13.351     8401      38      25     266    .077    10.8       49      .5      0    19.8
3 10 HG         631    .020   13.63    1125    13.713    12256      56      36     334    .147     2.9        2    20.5     21    16.0
4 16 HG         404    .010   13.27    1387    13.320     8401      25      13     290    .077     8.3        5    49.1     45    10.0
5 19 HG         313    .010   12.72     412    12.761     6096      15      10      65    .057     2.0        1    22.4     21    16.0
6 16 HG         314    .010   13.13    1362    13.171     8401      20      13     288    .077      .8        1     3.7      6    19.0
7  3 HG         543    .260   13.84     917    14.154    17963      69     667     386    .113     1.5        1    22.2     21    16.0
8 16 HG         315    .010   13.37    1534    13.411     8401      20      13     319    .077     7.8       75    43.7     68     3.0
9 C.T.         7315    .030    8.16      42     8.922     1560     128      11       2    .143     1.5        1    24.6     21    16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    18.3        2      .3      0    24.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     2.6        6     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     2.5        6     7.7
FOUR CYCLE COMPOSITE -                                                                         2.4        6     8.6
                                     HC- FID  0.35(      2.5) + 0.65(      2.4) =     2.455   GM/BHP HR
                                     CO- NDIR 0.35(      5.8) + 0.65(      6.4) =     6.217   GM/BHP HR
                                     NO2-CL   0.35(      7.7) + 0.65(      8.6) =     8.261   GM/BHP HR
                                                              CORRECTED NO2 =     8.515   GM/BHP HR
                                                                       BSFC =      .776   LB/BHP HR
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                          TABLE B-9.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-2   TEST-4  RUN-2    EGR-CAT.              04-13-73     K =1.031     HUM = 85.5  GR/LB
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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR             MAN.
MODE           HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2   FACT.   HC        CO    NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        108    .130   12.39     40   12.637    1919     18      40       2   .232    4.1        9     .5     0    19.8
2 16 HG        49    .030   12.86    995   12.943    8401     34      39     214   .077    2.6        3   16.5    21    16.0
3 10 HG        51    .030   13.41    820   13.495   12256     50      55     247   .147    7.4        8   36.3    45    10.0
4 16 HG        38    .020   12.99   1150   13.051    8401     26      26     246   .077    2.0        2   18.9    21    16.0
5 19 HG        33    .010   12.59    331   12.636    6096     17      10      53   .057    1.0        1    3.0     6    19.0
6 16 HG        42    .010   12.99   1150   13.045    8401     29      13     246   .077    2.2        1   18.9    21    16.0
7  3 HG        42    .240   13.84    978   14.125   17963     58     617     413   .113    6.5       70   46.7    68     3.0
8 16 HG        33    .020   13.27   1313   13.326    8401     22      26     275   .077    1.7        2   21.2    21    16.0
9 C.T.        744    .030    8.54     60    9.374    1560    134      10       3   .143   19.2        1     .5     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.2        5    7.7
1 IDLE        108    .130   12.39     40   12.637    1919     18      40       2   .232    4.1        9     .5     0    19.8
2 16 HG        63    .020   12.99   1150   13.078    8401     44      26     245   .077    3.4        2   18.9    21    16.0
3 10 HG        51    .030   13.50    846   13.585   12256     50      55     253   .147    7.3        8   37.2    45    10.0
4 16 HG        38    .020   13.13   1222   13.191    8401     26      26     258   .077    2.0        2   19.9    21    16.0
5 19 HG        28    .010   12.72    441   12.760    6096     14      10      69   .057     .8        1    4.0     6    19.0
6 16 HG        38    .020   13.13   1332   13.191    8401     26      26     282   .077    2.0        2   21.7    21    16.0
7  3 HG        42    .260   13.84   1011   14.145   17963     58     667     426   .113    6.5       75   48.2    68     3.0
8 16 HG        28    .020   13.27   1485   13.320    8401     19      25     311   .077    1.5        2   23.9    21    16.0
9 C.T.        749    .030    8.40     48    9.239    1560    137      10       3   .143   19.5        1     .4     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.2        5    8.3
1 IDLE        236    .120   12.20     93   12.575    1919     39      37       5   .232    9.0        9    1.1     0    19.8
2 16 HG        61    .020   13.13   1313   13.216    8401     42      26     277   .077    3.2        2   21.3    21    16.0
3 10 HG        51    .030   13.41    994   13.495   12256     50      55     300   .147    7.4        8   44.1    45    10.0
4 16 HG        33    .010   13.13   1332   13.176    8401     23      13     282   .077    1.7        1   21.7    21    16.0
5 19 HG        28    .010   12.59    371   12.630    6096     14      10      59   .057     .8        1    3.4     6    19.0
6 16 HG        37    .010   13.00   1332   13.050    8401     26      13     285   .077    2.0        1   21.9    21    16.0
7  3 HG        42    .270   13.69    978   14.005   17963     58     700     416   .113    6.6       79   47.1    68     3.0
8 16 HG        37    .010   13.20   1505   13.250    8401     25      13     317   .077    2.0        1   24.4    21    16.0
9 C.T.        711    .030    8.24     48    9.038    1560    133      10       3   .143   19.0        1     .4     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.4        5    8.8
1 IDLE        236    .020   12.20     73   12.475    1919     39       6       4   .232    9.1        1     .9     0    19.8
2 16 HG        51    .020   12.99   1370   13.065    8401     35      26     292   .077    2.7        2   22.5    21    16.0
3 10 HG        61    .020   13.27   1168   13.356   12256     60      37     356   .147    8.9        5   52.3    45    10.0
4 16 HG        44    .010   12.99   1276   13.048    8401     31      13     273   .077    2.4        1   21.0    21    16.0
5 19 HG        37    .010   12.59    394   12.640    6096     19      10      63   .057    1.1        1    3.6     6    19.0
6 16 HG        44    .020   12.99   1369   13.058    8401     31      26     292   .077    2.4        2   22.5    21    16.0
7  3 HG        47    .260   13.69    944   14.001   17963     65     674     402   .113    7.4       76   45.4    68     3.0
8 16 HG        42    .020   13.00   1446   13.065    8401     29      26     309   .077    2.2        2   23.8    21    16.0
9 C.T.        720    .030    8.14     60    8.948    1560    136      11       3   .143   19.4        2     .5     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.6        4    9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------   2.2        5    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------   2.5        5    8.9
FOUR CYCLE COMPOSITE =                   HC- NDIR 0.35(     2.2) + 0.65(     2.5) =     2.427   GM/BHP HR
                                         CO- NDIR 0.35(     4.7) + 0.65(     4.6) =     4.651   GM/BHP HR
                                         NO2-NDIR 0.35(     8.0) + 0.65(     8.9) =     8.606   GM/BHP HR
                                                            CORRECTED NO2 =     8.870   GM/BHP HR
                                                                     BSFC =      .776   LB/BHP HR


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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID   CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       1216    .130   12.39     25   12.642    1919     18      40       1   .232    4.3        9     .3     0    19.8
2 16 HG       414    .030   12.86   1021   12.931    8401     27      39     220   .077    2.1        3   17.0    21    16.0
3 10 HG       506    .030   13.41    825   13.491   12256     46      55     249   .147    6.8        8   36.6    45    10.0
4 16 HG       230    .020   12.99   1150   13.033    8401     15      26     246   .077    1.1        2   19.0    21    16.0
5 19 HG       112    .010   12.59    337   12.611    6096      5      10      54   .057     .3        1    3.1     6    19.0
6 16 HG       213    .010   12.99   1187   13.021    8401     14      13     254   .077    1.1        1   19.6    21    16.0
7  3 HG       362    .240   13.84    987   14.116   17963     46     617     417   .113    5.2       70   47.1    68     3.0
8 16 HG       197    .020   13.27   1312   13.310    8401     12      26     275   .077    1.0        2   21.2    21    16.0
9 C.T.       7987    .030    8.54     75    9.369    1560    133      10       4   .143   19.0        1     .6     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   1.9        5    7.8
1 IDLE       1216    .130   12.39     25   12.642    1919     18      40       1   .232    4.3        9     .3     0    19.8
2 16 HG       392    .020   12.99   1200   13.049    8401     25      26     256   .077    1.9        2   19.7    21    16.0
3 10 HG       495    .030   13.50    887   13.580   12256     45      55     266   .147    6.6        8   39.1    45    10.0
4 16 HG       213    .020   13.13   1275   13.171    8401     14      26     270   .077    1.0        2   20.8    21    16.0
5 19 HG       117    .010   12.72    462   12.742    6096      6      10      73   .057     .3        1    4.1     6    19.0
6 16 HG       236    .020   13.13   1375   13.174    8401     15      26     291   .077    1.2        2   22.4    21    16.0
7  3 HG       305    .260   13.84   1025   14.131   17963     39     668     433   .113    4.4       75   48.9    68     3.0
8 16 HG       157    .020   13.27   1525   13.306    8401     10      26     320   .077     .8        2   24.6    21    16.0
9 C.T.       7869    .030    8.40     63    9.217    1560    133      10       4   .143   19.0        1     .5     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   1.9        5    8.5
1 IDLE       1610    .120   12.20     50   12.481    1919     25      37       3   .232    5.7        9     .6     0    19.8
2 16 HG       404    .020   13.13   1387   13.190    8401     26      26     293   .077    2.0        2   22.6    21    16.0
3 10 HG       517    .030   13.41   1020   13.492   12256     47      55     308   .147    6.9        8   45.2    45    10.0
4 16 HG       219    .010   13.13   1390   13.162    8401     14      13     295   .077    1.1        1   22.7    21    16.0
5 19 HG       201    .010   12.59    388   12.620    6096     10      10      62   .057     .5        1    3.5     6    19.0
6 16 HG       224    .010   13.00   1387   13.032    8401     14      13     297   .077    1.1        1   22.9    21    16.0
7  3 HG       316    .270   13.69    975   13.992   17963     41     700     416   .113    4.6       79   47.0    68     3.0
8 16 HG       157    .010   13.20   1542   13.226    8401     10      13     329   .077     .8        1   25.4    21    16.0
9 C.T.       7643    .030    8.24     63    9.034    1560    132      10       4   .143   18.9        1     .5     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.0        5    9.0
1 IDLE       1608    .020   12.20     50   12.381    1919     25       6       3   .232    5.8        1     .6     0    19.8
2 16 HG       392    .020   12.99   1325   13.049    8401     25      26     283   .077    1.9        2   21.8    21    16.0
3 10 HG       578    .020   13.27   1212   13.348   12256     53      37     369   .147    7.8        5   54.3    45    10.0
4 16 HG       213    .010   12.99   1362   13.021    8401     14      13     292   .077    1.1        1   22.5    21    16.0
5 19 HG       112    .010   12.59    413   12.611    6096      5      10      66   .057     .3        1    3.7     6    19.0
6 16 HG       218    .020   12.99   1450   13.032    8401     14      26     310   .077    1.1        2   23.9    21    16.0
7  3 HG       316    .260   13.69    975   13.982   17963     41     675     416   .113    4.6       76   47.0    68     3.0
8 16 HG       146    .020   13.00   1500   13.035    8401      9      26     321   .077     .7        2   24.7    21    16.0
9 C.T.       7744    .030    8.14     70    8.944    1560    135      11       4   .143   19.3        2     .6     0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------   2.0        4    9.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------   1.9        5    8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------   2.0        5    9.2
FOUR CYCLE COMPOSITE =                   HC- FID  0.35(     1.9) + 0.65(     2.0) =     1.961   GM/BHP HR
                                         CO- NDIR 0.35(     4.7) + 0.65(     4.6) =     4.656   GM/BHP HR
                                         NO2-CL   0.35(     8.2) + 0.65(     9.2) =     8.847   GM/BHP HR
                                                            CORRECTED NO2 =     9.119   GM/BHP HR
                                                                     BSFC =      .776   LB/BHP HR
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                              TABLE B-10. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-2    TEST-6   RUN-3     EGR-CAT.                  04-13-73        K =1.031       HUM = 85.5  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.         WEIGHTED GM/HR         MAN.
MODE           HC      CO     CO2     NO    CARBON   CONS.      HC      CO      NO2    FACT.    HC       CO     NO2    HP   VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE        150    .420   12.32     98   12.902    1919       24     126        5    .232     5.6      29     1.1     0   19.8
2 16 HG        47    .030   12.86   1063   12.941    8401       33      39      229    .077     2.5       3    17.6    21   16.0
3 10 HG        47    .030   13.41    949   13.491   12256       46      55      285    .147     6.8       8    41.9    45   10.0
4 16 HG        33    .020   12.99   1115   13.046    8401       23      26      238    .077     1.8       2    18.3    21   16.0
5 19 HG        33    .020   12.59    913   12.646    6096       17      19       66    .057     1.0       1     3.7     6   19.0
6 16 HG        33    .020   12.86   1150   12.916    8401       23      26      248    .077     1.8       2    19.1    21   16.0
7  3 HG        35    .260   13.69    995   13.988   17963       49     674      424    .113     5.5      76    47.9    68    3.0
8 16 HG        23    .020   13.13   1370   13.175    8401       16      26      290    .077     1.2       2    22.3    21   16.0
9 C.T.        615    .090    9.24    110    9.994    1560      104      13        6    .143    14.9       2      .8     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.9       6     8.2
1 IDLE        150    .420   12.32     98   12.902    1919       24     126        5    .232     5.6      29     1.1     0   19.8
2 16 HG        56    .030   12.99   1168   13.080    8401       39      39      249    .077     3.0       3    19.2    21   16.0
3 10 HG        51    .030   13.41    978   13.495   12256       50      55      295    .147     7.4       8    43.3    45   10.0
4 16 HG        37    .020   12.99   1186   13.050    8401       26      26      253    .077     2.0       2    19.5    21   16.0
5 19 HG        33    .010   12.59    913   12.636    6096       17      10       66    .057     1.0       1     3.7     6   19.0
6 16 HG        23    .020   12.99   1313   13.035    8401       16      26      281    .077     1.2       2    21.6    21   16.0
7  3 HG        28    .280   13.69    863   14.000   17963       39     726      368    .113     4.4      82    41.5    68    3.0
8 16 HG        23    .020   13.13   1351   13.175    8401       16      26      286    .077     1.2       2    22.0    21   16.0
9 C.T.        635    .030    8.87     60    9.586    1560      112      10        3    .143    16.0       1      .5     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.0       6     8.2
1 IDLE        183    .670   12.46     98   13.328    1919       28     195        5    .232     6.6      45     1.1     0   19.8
2 16 HG        56    .020   13.13   1240   13.210    8401       38      26      262    .077     3.0       2    20.2    21   16.0
3 10 HG        42    .030   13.55    978   13.625   12256       41      55      292    .147     6.0       8    42.9    45   10.0
4 16 HG        28    .020   13.13   1313   13.180    8401       19      26      278    .077     1.5       2    21.4    21   16.0
5 19 HG        28    .010   12.72    913   12.760    6096       14      10       65    .057      .8       1     3.7     6   19.0
6 16 HG        33    .020   13.13   1240   13.186    8401       23      26      262    .077     1.7       2    20.2    21   16.0
7  3 HG        37    .280   13.84    895   14.160   17963       51     718      377    .113     5.7      81    42.6    68    3.0
8 16 HG        33    .020   13.13   1466   13.186    8401       23      26      310    .077     1.7       2    23.9    21   16.0
9 C.T.        616    .030    9.20    112    9.895    1560      105      10        6    .143    15.0       1      .8     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.0       7     8.4
1 IDLE        183    .670   12.46     98   13.328    1919       28     195        5    .232     6.6      45     1.1     0   19.8
2 16 HG        56    .030   13.13   1240   13.220    8401       38      39      262    .077     3.0       3    20.1    21   16.0
3 10 HG        56    .030   13.55   1097   13.640   12256       54      54      327    .147     8.0       8    48.1    45   10.0
4 16 HG        37    .020   13.13   1276   13.190    8401       25      26      270    .077     2.0       2    20.8    21   16.0
5 19 HG        33    .010   12.72    955   12.766    6096       17      10       72    .057     1.0       1     4.1     6   19.0
6 16 HG        33    .020   13.13   1295   13.186    8401       23      26      274    .077     1.7       2    21.1    21   16.0
7  3 HG        28    .260   13.84   1012   14.130   17963       38     668      427    .113     4.3      75    48.3    68    3.0
8 16 HG        33    .030   13.27   1332   13.336    8401       22      38      279    .077     1.7       3    21.5    21   16.0
9 C.T.        673    .030    9.24     94    9.997    1560      113       9        5    .143    16.2       1      .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.1       7     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     2.0       6     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     2.0       7     8.6
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     2.0) + 0.65(     2.0) =     2.018   GM/BHP HR
                                          CO- NDIR 0.35(     6.1) + 0.65(     6.7) =     6.497   GM/BHP HR
                                          NO2-NDIR 0.35(     8.2) + 0.65(     8.6) =     8.439   GM/BHP HR
                                                             CORRECTED NO2 =     8.690   GM/BHP HR
                                                                      BSFC =      .776   LB/BHP HR
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              CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.       WEIGHTED GM/HR           MAN.
MODE         HC-FID    CO     CO2  NO-CL    CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID     CO  NO2-CL    HP   VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE       3091    .420   12.32     37   13.044    1919       45     125        2    .232    10.4      29      .4     0   19.8
2 16 HG       437    .030   12.86   1025   12.934    8401       28      39      221    .077     2.2       3    17.0    21   16.0
3 10 HG       520    .030   13.41    888   13.493   12256       48      55      268    .147     7.1       8    39.4    45   10.0
4 16 HG       218    .020   12.99   1125   13.032    8401       14      26      241    .077     1.1       2    18.5    21   16.0
5 19 HG       100    .020   12.59    387   12.620    6096        5      19       62    .057      .3       1     3.5     6   19.0
6 16 HG       213    .020   12.86   1137   12.901    8401       14      26      246    .077     1.1       2    18.9    21   16.0
7  3 HG       316    .260   13.69    975   13.982   17963       41     675      416    .113     4.6      76    47.0    68    3.0
8 16 HG       135    .020   13.13   1313   13.163    8401        9      26      278    .077      .7       2    21.4    21   16.0
9 C.T.       7419    .090    9.24    106   10.021    1560      115      13        5    .143    16.5       2      .8     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.1       6     7.9
1 IDLE       3091    .420   12.32     37   13.044    1919       45     125        2    .232    10.4      29      .4     0   19.8
2 16 HG       650    .030   12.99   1162   13.085    8401       42      39      248    .077     3.2       3    19.1    21   16.0
3 10 HG       483    .030   13.41    963   13.488   12256       44      55      291    .147     6.5       8    42.7    45   10.0
4 16 HG       179    .020   12.99   1200   13.028    8401       12      26      257    .077      .9       2    19.8    21   16.0
5 19 HG        78    .010   12.59    388   12.608    6096        4      10       62    .057      .2       1     3.5     6   19.0
6 16 HG       179    .020   12.99   1325   13.028    8401       12      26      284    .077      .9       2    21.8    21   16.0
7  3 HG       294    .280   13.69    850   13.999   17963       38     726      362    .113     4.3      82    40.9    68    3.0
8 16 HG       112    .020   13.13   1345   13.161    8401        7      26      285    .077      .6       2    21.9    21   16.0
9 C.T.       6763    .030    8.87    106    9.576    1560      110      10        6    .143    15.8       1      .8     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     2.0       6     8.1
1 IDLE       3050    .670   12.46     38   13.435    1919       44     193        2    .232    10.1      45      .4     0   19.8
2 16 HG       359    .020   13.13   1225   13.186    8401       23      26      259    .077     1.8       2    20.0    21   16.0
3 10 HG       450    .030   13.55    975   13.625   12256       41      55      291    .147     6.0       8    42.8    45   10.0
4 16 HG       179    .020   13.13   1313   13.168    8401       11      26      278    .077      .9       2    21.4    21   16.0
5 19 HG        78    .010   12.72    388   12.738    6096        4      10       61    .057      .2       1     3.5     6   19.0
6 16 HG       179    .020   13.13   1263   13.168    8401       11      26      268    .077      .9       2    20.6    21   16.0
7  3 HG       260    .280   13.84    888   14.146   17963       33     718      374    .113     3.7      81    42.3    68    3.0
8 16 HG       110    .020   13.13   1475   13.161    8401        7      26      313    .077      .5       2    24.1    21   16.0
9 C.T.       6613    .030    9.20    106    9.891    1560      104      10        6    .143    14.9       1      .8     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.8       7     8.3
1 IDLE       3050    .670   12.46     38   13.435    1919       44     193        2    .232    10.1      45      .4     0   19.8
2 16 HG       337    .030   13.13   1237   13.194    8401       21      39      262    .077     1.6       3    20.1    21   16.0
3 10 HG       495    .030   13.55   1075   13.630   12256       45      54      321    .147     6.5       8    47.2    45   10.0
4 16 HG       179    .020   13.13   1300   13.168    8401       11      26      275    .077      .9       2    21.2    21   16.0
5 19 HG        89    .010   12.72    438   12.739    6096        4      10       69    .057      .2       1     3.9     6   19.0
6 16 HG       179    .020   13.13   1300   13.168    8401       11      26      275    .077      .9       2    21.2    21   16.0
7  3 HG       271    .260   13.84    988   14.127   17963       34     668      417    .113     3.9      75    47.1    68    3.0
8 16 HG       213    .030   13.27   1338   13.321    8401       13      38      280    .077     1.0       3    21.6    21   16.0
9 C.T.       6863    .030    9.24    141    9.956    1560      108       9        7    .143    15.4       1     1.0     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.9       7     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     2.0       6     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     1.9       7     8.5
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     2.0) + 0.65(     1.9) =     1.940   GM/BHP HR
                                          CO- NDIR 0.35(     6.0) + 0.65(     6.7) =     6.483   GM/BHP HR
                                          NO2-CL   0.35(     8.0) + 0.65(     8.5) =     8.333   GM/BHP HR
                                                             CORRECTED NO2 =     8.590   GM/BHP HR
                                                                      BSFC =      .776   LB/BHP HR
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                     TABLE B-11. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-2   TEST-6   RUN-4   EGR-CAT.              04-23-73      K =1.092      HUM =114.4  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE           HC      CO     CO2     NO   CARBON   CONS.      HC        CO      NO2     FACT.     HC          CO      NO2     HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        105    .210   12.86     66   13.183    1919      17        62        3     .232      3.9         14       .7      0     19.8
2 16 HG        45    .030   13.00    895   13.079    8401      31        39      191     .077      2.4          3     14.7     21     16.0
3 10 HG        44    .040   13.58   1045   13.668   12256      43        72      311     .147      6.3         11     45.7     45     10.0
4 16 HG        20    .020   13.14   1045   13.182    8401      14        26      221     .077      1.1          2     17.0     21     16.0
5 19 HG        16    .010   12.59    303   12.617    6046       8        10       48     .057       .5          1      2.7      6     19.0
6 16 HG        26    .020   13.14   1132   13.188    8401      18        26      239     .077      1.4          2     18.4     21     16.0
7  3 HG        28    .420   13.73    830   14.180   17963      38      1075      349     .113      4.3        121     39.4     68      3.0
8 16 HG        23    .020   13.29   1350   13.335    8401      16        25      282     .077      1.2          2     21.7     21     16.0
9 C.T.        830    .030    8.43     60    9.356    1560     149        10        3     .143     21.4          1       .5      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.0          7      7.6
1 IDLE        105    .210   12.86     66   13.183    1919      17        62        3     .232      3.8         14       .7      0     19.8
2 16 HG        48    .030   13.14    990   13.222    8401      33        39      209     .077      2.5          3     16.1     21     16.0
3 10 HG        39    .040   13.43    961   13.512   12256      38        73      289     .147      5.6         11     42.5     45     10.0
4 16 HG        32    .020   13.29   1112   13.345    8401      22        25      237     .077      1.7          2     18.2     21     16.0
5 19 HG        27    .010   12.72    309   12.759    6046      14        10       49     .057       .8          1      2.8      6     19.0
6 16 HG        35    .020   12.45   1258   12.508    8401      25        27      281     .077      2.0          2     21.6     21     16.0
7  3 HG        37    .390   13.73    830   14.160   17963      51       999      350     .113      5.7        113     39.5     68      3.0
8 16 HG        29    .020   13.29   1167   13.341    8401      20        25      244     .077      1.5          2     18.8     21     16.0
9 C.T.        825    .030    8.30     50    9.221    1560     151        10        3     .143     21.6          1       .4      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.1          7      7.6
1 IDLE         67    .200   13.00     48   13.272    1919      10        58        2     .232      2.4         14       .5      0     19.8
2 16 HG        34    .020   13.29   1062   13.347    8401      23        25      222     .077      1.8          2     17.1     21     16.0
3 10 HG        51    .040   13.73   1029   13.825   12256      49        72      303     .147      7.2         11     44.5     45     10.0
4 16 HG        37    .020   13.29   1258   13.350    8401      25        25      263     .077      1.9          2     20.2     21     16.0
5 19 HG        29    .010   12.59    317   12.631    6046      15        10       50     .057       .9          1      2.9      6     19.0
6 16 HG        35    .020   13.14   1203   13.198    8401      24        26      254     .077      1.9          2     19.6     21     16.0
7  3 HG        37    .470   13.73    798   14.240   17963      50      1198      334     .113      5.7        135     37.8     68      3.0
8 16 HG        32    .020   13.29   1221   13.345    8401      22        25      255     .077      1.7          2     19.7     21     16.0
9 C.T.        790    .030    8.35     48    9.233    1560     144        10        3     .143     20.6          1       .4      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.1          8      7.7
1 IDLE         67    .200   13.00     48   13.272    1919      10        58        2     .232      2.4         14       .5      0     19.8
2 16 HG        46    .030   13.29   1150   13.370    8401      31        38      240     .077      2.4          3     18.5     21     16.0
3 10 HG        54    .040   13.73    994   13.828   12256      52        72      292     .147      7.6         11     43.0     45     10.0
4 16 HG        35    .020   13.29   1313   13.348    8401      24        25      274     .077      1.8          2     21.1     21     16.0
5 19 HG        27    .010   12.72    317   12.759    6046      14        10       50     .057       .8          1      2.8      6     19.0
6 16 HG        37    .020   13.29   1331   13.350    8401      25        25      278     .077      1.9          2     21.4     21     16.0
7  3 HG        39    .500   13.73    830   14.272   17963      53      1271      347     .113      6.0        144     39.2     68      3.0
8 16 HG        32    .020   13.29   1248   13.345    8401      22        25      261     .077      1.7          2     20.1     21     16.0
9 C.T.        765    .030    8.38     52    9.236    1560     140        10        3     .143     20.0          1       .4      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.1          8      7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      2.1          7      7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      2.1          8      7.8
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(     2.1) + 0.65(     2.1) =     2.088   GM/BHP HR
                                        CO- NDIR 0.35(     7.3) + 0.65(     8.2) =     7.889   GM/BHP HR
                                        NO2-NDIR 0.35(     7.6) + 0.65(     7.8) =     7.736   GM/BHP HR
                                                               CORRECTED NO2 =     8.445   GM/BHP HR
                                                                        BSFC =      .776   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE          HC-FID    CO     CO2  NO-CL  CARBON   CONS.      HC        CO      NO2     FACT.   HC-FID        CO   NO2-CL     HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       1295    .210   12.86     31   13.199    1919      19        62        1     .232      4.4         14       .3      0     19.8
2 16 HG       426    .030   13.00    837   13.073    8401      27        39      179     .077      2.1          3     13.8     21     16.0
3 10 HG       653    .040   13.58    929   13.685   12256      58        72      276     .147      8.6         11     40.6     45     10.0
4 16 HG       269    .020   13.14    995   13.187    8401      17        26      210     .077      1.3          2     16.2     21     16.0
5 19 HG        89    .010   12.59    278   12.609    6046       4        10       44     .057       .2          1      2.5      6     19.0
6 16 HG       247    .020   13.14   1087   13.185    8401      16        26      230     .077      1.2          2     17.7     21     16.0
7  3 HG       379    .420   13.73    775   14.188   17963      48      1074      326     .113      5.4        121     36.8     68      3.0
8 16 HG       180    .020   13.29   1281   13.328    8401      11        25      268     .077       .9          2     20.6     21     16.0
9 C.T.       8303    .030    8.43     82    9.290    1560     139        10        5     .143     19.9          1       .7      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.1          7      7.1
1 IDLE       1295    .210   12.86     31   13.199    1919      19        62        1     .232      4.4         14       .3      0     19.8
2 16 HG       415    .030   13.14    950   13.212    8401      26        39      201     .077      2.0          3     15.4     21     16.0
3 10 HG       630    .040   13.43    875   13.533   12256      57        73      263     .147      8.4         11     38.7     45     10.0
4 16 HG       225    .020   13.29   1087   13.332    8401      14        25      227     .077      1.1          2     17.5     21     16.0
5 19 HG        67    .010   12.72    295   12.737    6046       3        10       46     .057       .2          1      2.7      6     19.0
6 16 HG       245    .020   12.45   1225   12.495    8401      16        27      273     .077      1.3          2     21.1     21     16.0
7  3 HG       384    .390   13.73    775   14.158   17963      49       999      326     .113      5.5        113     36.9     68      3.0
8 16 HG       135    .020   13.29   1105   13.323    8401       8        25      231     .077       .7          2     17.8     21     16.0
9 C.T.       8724    .030    8.30     70    9.202    1560     148        10        4     .143     21.1          1       .6      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.1          7      7.1
1 IDLE        718    .200   13.00     30   13.272    1919      10        58        1     .232      2.4         14       .3      0     19.8
2 16 HG       343    .020   13.29   1075   13.344    8401      22        25      225     .077      1.7          2     17.3     21     16.0
3 10 HG       648    .040   13.73    950   13.835   12256      57        72      279     .147      8.4         11     41.1     45     10.0
4 16 HG       225    .020   13.29   1162   13.332    8401      14        25      243     .077      1.1          2     18.7     21     16.0
5 19 HG        89    .010   12.59    275   12.609    6046       4        10       44     .057       .2          1      2.5      6     19.0
6 16 HG       247    .020   13.14   1181   13.185    8401      16        26      250     .077      1.2          2     19.2     21     16.0
7  3 HG       385    .470   13.73    787   14.238   17963      49      1198      330     .113      5.5        135     37.2     68      3.0
8 16 HG       146    .020   13.29   1162   13.325    8401       9        25      243     .077       .7          2     18.7     21     16.0
9 C.T.       8405    .030    8.35     75    9.220    1560     142        10        4     .143     20.3          1       .6      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.0          8      7.4
1 IDLE        718    .200   13.00     30   13.272    1919      10        58        1     .232      2.4         14       .3      0     19.8
2 16 HG       399    .030   13.29   1075   13.360    8401      25        38      224     .077      1.9          3     17.3     21     16.0
3 10 HG       671    .040   13.73    962   13.837   12256      59        72      283     .147      8.7         11     41.6     45     10.0
4 16 HG       247    .020   13.29   1325   13.335    8401      16        25      277     .077      1.2          2     21.3     21     16.0
5 19 HG        67    .010   12.72    300   12.737    6046       3        10       47     .057       .2          1      2.7      6     19.0
6 16 HG       270    .020   13.29   1287   13.337    8401      17        25      269     .077      1.3          2     20.7     21     16.0
7  3 HG       385    .500   13.73    787   14.268   17963      48      1272      329     .113      5.5        144     37.2     68      3.0
8 16 HG       157    .020   13.29   1225   13.326    8401      10        25      256     .077       .8          2     19.7     21     16.0
9 C.T.       8353    .030    8.38     80    9.245    1560     141        10        4     .143     20.2          1       .6      0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      2.0          8      7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      2.1          7      7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      2.0          8      7.5
FOUR CYCLE COMPOSITE =                  HC- FID  0.35(     2.1) + 0.65(     2.0) =     2.023   GM/BHP HR
                                        CO- NDIR 0.35(     7.2) + 0.65(     8.2) =     7.889   GM/BHP HR
                                        NO2-CL   0.35(     7.1) + 0.65(     7.5) =     7.367   GM/BHP HR
                                                               CORRECTED NO2 =     8.042   GM/BHP HR
                                                                        BSFC =      .776   LB/BHP HR
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                       TABLE B-12. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-0   TEST-12  RUN-1   1972 STANDARD ENGINE  09-24-73     K =1.099     HUM =120.1  GR/LB
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             CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR          MAN.
MODE         HC      CO     CO2      NO    CARBON   CONS.      HC      CO      NO2     FACT.   HC       CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       207    .720   10.92     72    11.864    1701      32     209        3     .232    7.4      48      .8    0    19.2
2 16 HG       65    .190   12.95    961    12.660    8119      45     181      205     .077    3.5      14    15.8   21    16.0
3 10 HG       98    .130   13.19   3098    13.376   13109     104     257      992     .147   15.2      38   145.8   51    10.0
4 16 HG       51    .120   12.59    994    12.765    8119      35     154      210     .077    2.7      12    16.2   21    16.0
5 19 HG       37    .090   12.59    277    12.720    5715      18      82       41     .057    1.0       5     2.4    6    19.0
6 16 HG       46    .120   12.59   1011    12.760    8119      32     154      219     .077    2.4      12    16.9   21    16.0
7  3 HG       51    .740   13.00   1504    13.795   18643      74    2020      675     .113    8.4     228    76.3   74     3.0
8 16 HG       46    .130   12.86   1239    13.040    8119      31     164      256     .077    2.4      13    19.7   21    16.0
9 C.T.      2020    .180    5.74     73     8.102    1633     440      73        5     .143   62.9      10      .7    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.7      17    13.0
1 IDLE       207    .720   10.92     72    11.864    1701      32     209        3     .232    7.4      48      .8    0    19.0
2 16 HG       65    .150   12.59    961    12.810    8119      44     192      202     .077    3.4      15    15.6   21    16.0
3 10 HG       93    .180   13.29   3168    13.570   13109      97     351     1016     .147   14.3      52   149.4   51    10.0
4 16 HG       51    .130   12.86   1132    13.045    8119      34     163      234     .077    2.6      13    18.0   21    16.0
5 19 HG       37    .090   12.45    317    12.580    5715      18      83       48     .057    1.0       5     2.7    6    19.0
6 16 HG       46    .130   12.72   1132    12.900    8119      31     165      237     .077    2.4      13    18.2   21    16.0
7  3 HG       23    .760   13.14   1504    13.915   18643      33    2030      669     .113    3.8     229    75.6   74     3.0
8 16 HG       23    .140   12.86   1221    13.025    8119      15     176      253     .077    1.2      14    19.5   21    16.0
9 C.T.      1873    .220    6.13     72     8.373    1633     395      87        5     .143   56.4      12      .7    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.1      18    13.3
1 IDLE       207   1.100   13.00    122    14.324    1701      27     264        5     .232    6.2      61     1.1    0    19.2
2 16 HG       70    .160   12.72   1132    12.956    8119      47     203      236     .077    3.6      16    18.1   21    16.0
3 10 HG       88    .180   13.29   3261    13.565   13109      92     351     1046     .147   13.5      52   153.8   51    10.0
4 16 HG       51    .130   12.86   1167    13.045    8119      34     163      241     .077    2.6      13    18.6   21    16.0
5 19 HG       37    .670   12.45    344    13.160    5715      17     588       50     .057    1.0      34     2.8    6    19.0
6 16 HG       46    .130   12.72   1239    12.900    8119      31     165      259     .077    2.4      13    19.9   21    16.0
7  3 HG       51    .720   13.14   1604    13.915   18643      74    1949      713     .113    8.3     220    80.6   74     3.0
8 16 HG       37    .140   13.00   1369    13.180    8119      25     174      280     .077    1.9      13    21.6   21    16.0
9 C.T.      1915    .200    6.05     85     8.318    1633     406      79        6     .143   58.1      11      .8    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.3      19    14.1
1 IDLE       207   1.100   13.00    122    14.324    1701      27     264        5     .232    6.2      61     1.1    0    19.0
2 16 HG       56    .160   12.72   1132    12.940    8119      38     203      236     .077    2.9      16    18.2   21    16.0
3 10 HG       88    .190   13.29   3355    13.575   13109      92     371     1076     .147   13.5      54   158.1   51    10.0
4 16 HG       27    .140   12.87   1258    13.039    8119      18     176      260     .077    1.4      14    20.0   21    16.0
5 19 HG        9    .080   12.31    344    12.400    5715       4      74       53     .057     .3       4     3.0    6    19.0
6 16 HG       27    .140   12.72   1258    12.889    8119      18     178      263     .077    1.4      14    20.3   21    16.0
7  3 HG       41    .710   13.14   1584    13.894   18643      59    1920      706     .113    6.7     217    79.7   74     3.0
8 16 HG       37    .140   12.86   1276    13.040    8119      25     176      264     .077    1.9      14    20.3   21    16.0
9 C.T.      1914    .210    6.13     97     8.407    1633     402      82        6     .143   57.4      12      .9    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.1      18    14.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------      4.4      17    13.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------      4.2      19    14.1
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(     4.4) + 0.65(     4.2) =     4.263   GM/BHP HR
                                        CO- NDIR 0.35(    17.3) + 0.65(    18.5) =    18.101   GM/BHP HR
                                        NO2-NDIR 0.35(    13.2) + 0.65(    14.1) =    13.800   GM/BHP HR
                                                             CORRECTED NO2 =    15.170   GM/BHP HR
                                                                      BSFC =      .731   LB/BHP HR


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             CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR          MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO      NO2     FACT.  HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE      2991    .720   10.92     38    11.939    1701      43     207        2     .232    9.9      48      .4    0    19.2
2 16 HG      938    .190   12.95    775    12.684    8119      60     181      165     .077    4.6      14    12.7   21    16.0
3 10 HG     1729    .130   13.19   3000    13.443   13109     169     256      971     .147   24.8      38   142.8   51    10.0
4 16 HG      715    .120   12.59   1050    12.782    8119      45     154      221     .077    3.5      12    17.1   21    16.0
5 19 HG      335    .090   12.59    255    12.714    5715      15      82       38     .057     .9       5     2.2    6    19.0
6 16 HG      671    .120   12.59    962    12.777    8119      43     154      203     .077    3.3      12    15.6   21    16.0
7  3 HG      812    .740   13.00   1500    13.821   18643     109    2016      672     .113   12.4     228    75.9   74     3.0
8 16 HG      650    .130   12.86   1175    13.055    8119      40     163      243     .077    3.1      13    18.7   21    16.0
9 C.T.     22839    .180    5.74     81     8.203    1633     455      72        5     .143   65.0      10      .8    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      5.6      17    12.7
1 IDLE      2991    .720   10.92     38    11.939    1701      43     207        2     .232    9.9      48      .4    0    19.0
2 16 HG      984    .150   12.59    925    12.838    8119      62     192      194     .077    4.8      15    15.0   21    16.0
3 10 HG     1912    .180   13.29   3200    13.661   13109     183     349     1019     .147   27.0      51   149.9   51    10.0
4 16 HG      817    .130   12.86   1125    13.072    8119      60     155      221     .077    4.6      12    17.0   21    16.0
5 19 HG      335    .090   12.45    288    12.573    5715      15      83       43     .057     .9       5     2.5    6    19.0
6 16 HG      761    .130   12.72   1100    12.926    8119      48     165      229     .077    3.7      13    17.7   21    16.0
7  3 HG      790    .750   13.14   1475    13.969   18643     105    2022      654     .113   11.9     228    73.9   74     3.0
8 16 HG      605    .140   12.86   1163    13.060    8119      38     176      240     .077    2.9      14    18.5   21    16.0
9 C.T.     22603    .220    6.13     76     8.610    1633     429      84        5     .143   61.3      12      .7    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      5.6      18    13.1
1 IDLE      3866   1.100   13.00     50    14.487    1701      45     261        2     .232   10.5      61      .5    0    19.2
2 16 HG     1119    .160   12.72   1088    12.992    8119      70     202      226     .077    5.4      16    17.4   21    16.0
3 10 HG     1957    .180   13.29   3300    13.666   13109     188     349     1051     .147   27.6      51   154.5   51    10.0
4 16 HG      807    .130   12.86   1213    13.071    8119      50     163      250     .077    3.9      13    19.3   21    16.0
5 19 HG      336    .670   12.45    313    13.154    5715      15     588       45     .057     .8      34     2.6    6    19.0
6 16 HG      806    .130   12.72   1200    12.931    8119      51     165      250     .077    3.9      13    19.3   21    16.0
7  3 HG      835    .720   13.14   1575    13.943   18643     112    1945      699     .113   12.6     220    79.0   74     3.0
8 16 HG      673    .140   13.00   1300    13.207    8119      41     174      265     .077    3.2      13    20.4   21    16.0
9 C.T.     23194    .200    6.05     84     8.569    1633     442      77        5     .143   63.2      11      .8    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      5.8      19    13.9
1 IDLE      3866   1.100   13.00     50    14.487    1701      45     261        2     .232   10.5      61      .5    0    19.0
2 16 HG     1052    .160   12.72   1075    12.985    8119      66     202      223     .077    5.1      16    17.2   21    16.0
3 10 HG     2032    .190   13.29   3400    13.680   13109     192     368     1082     .147   28.2      54   159.0   51    10.0
4 16 HG      762    .140   12.87   1175    13.086    8119      47     175      242     .077    3.6      14    18.6   21    16.0
5 19 HG      312    .080   12.31    300    12.421    5715      14      74       46     .057     .8       4     2.6    6    19.0
6 16 HG      783    .140   12.72   1213    12.938    8119      49     177      253     .077    3.8      14    19.5   21    16.0
7  3 HG      767    .710   13.14   1538    13.927   18643     103    1920      684     .113   11.6     217    77.2   74     3.0
8 16 HG      650    .140   12.86   1225    13.065    8119      40     176      253     .077    3.1      14    19.5   21    16.0
9 C.T.     24388    .210    6.13     70     8.779    1633     454      79        4     .143   64.9      11      .6    0    24.0
--------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      5.8      18    13.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------      5.6      17    12.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------      5.8      18    13.9
FOUR CYCLE COMPOSITE =                  HC- FID  0.35(     5.6) + 0.65(     5.8) =     5.73    GM/BHP HR
                                        CO- NDIR 0.35(    17.2) + 0.65(    18.5) =    18.011   GM/BHP HR
                                        NO2-CL   0.35(    12.9) + 0.65(    13.9) =    13.546   GM/BHP HR
                                                             CORRECTED NO2 =    14.891   GM/BHP HR
                                                                      BSFC =      .731   LB/BHP HR
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                 TABLE B-13. MASS EMISSIONS BY NINE-MODE FTP
ENGINE [illegible]   1972 STANDARD ENGINE  04-24-73      K =1.101      HUM =122.0  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.        WEIGHTED GM/HR          MAN.
MODE        HC     CO     CO2     NO    CARBON    CONS.     HC      CO     NO2   FACT.    HC       CO    NO2     HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE     216   .910  10.80     97    11.943    1701      33     262      5   .232     7.7      61    1.1     0   19.2
2 16 HG     60   .130  12.31    862    12.505    8119      42     170    186   .077     3.2      13   14.3    21   16.0
3 10 HG     88   .120  13.14   3323    13.355   13109      93     238   1083   .147    13.7      35  159.2    51   10.0
4 16 HG     47   .120  12.59   1080    12.761    8119      32     154    228   .077     2.5      12   17.6    21   16.0
5 19 HG     37   .080  12.05    290    12.170    5715      19      76     45   .057     1.1       4    2.6     6   19.0
6 16 HG     42   .120  12.45   1062    12.615    8119      29     156    227   .077     2.2      12   17.5    21   16.0
7  3 HG     46   .710  13.00   1564    13.760   18693      67    1943    704   .113     7.6     220   79.5    74    3.0
8 16 HG     42   .140  12.72   1221    12.905    8119      29     178    255   .077     2.2      14   19.6    21   16.0
9 C.T.    1936   .200   5.74     85     8.031    1633     425      82      6   .143    60.8      12     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.5      17   13.8
1 IDLE     216   .910  10.80     97    11.943    1701      33     262      5   .232     7.7      61    1.1     0   19.2
2 16 HG     46   .140  12.59   1062    12.780    8119      32     180    224   .077     2.4      14   17.2    21   16.0
3 10 HG     74   .140  13.14   3419    13.360   13109      78     277   1114   .147    11.5      41  163.7    51   10.0
4 16 HG     32   .120  12.59   1150    12.745    8119      22     154    243   .077     1.7      12   18.7    21   16.0
5 19 HG     18   .080  12.31    317    12.409    5715       9      74     48   .057      .5       4    2.8     6   19.0
6 16 HG     27   .120  12.59   1167    12.739    8119      19     154    247   .077     1.4      12   19.0    21   16.0
7  3 HG     28   .670  13.00   1686    13.700   18693      41    1842    762   .113     4.6     208   86.1    74    3.0
8 16 HG     32   .130  12.59   1258    12.755    8119      22     167    266   .077     1.7      13   20.5    21   16.0
9 C.T.    1947   .180   5.81     66     8.093    1633     424      73      4   .143    60.7      10     .6     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.1      17   14.6
1 IDLE     197  1.080  11.66    122    12.953    1701      28     286      5   .232     6.5      66    1.2     0   19.2
2 16 HG     60   .130  12.45   1132    12.645    8119      42     169    241   .077     3.2      13   18.6    21   16.0
3 10 HG     84   .130  13.00   3484    13.221   13109      90     260   1147   .147    13.2      38  168.6    51   10.0
4 16 HG     46   .130  12.59   1258    12.770    8119      32     167    266   .077     2.4      13   20.4    21   16.0
5 19 HG     37   .120  12.05    367    12.210    5715      19     113     55   .057     1.1       6    3.2     6   19.0
6 16 HG     46   .130  12.59   1313    12.770    8119      32     167    277   .077     2.4      13   21.3    21   16.0
7  3 HG     37   .650  13.00   1686    13.690   18693      54    1788    762   .113     6.1     202   86.1    74    3.0
8 16 HG     37   .140  12.72   1907    12.900    8119      25     178    294   .077     1.9      14   22.6    21   16.0
9 C.T.    1938   .220   6.05     85     8.363    1633     409      87      6   .143    58.4      12     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.2      17   15.2
1 IDLE     197  1.080  11.66    122    12.953    1701      28     286      5   .232     6.5      66    1.2     0   19.2
2 16 HG     75   .150  12.59   1185    12.821    8119      51     192    249   .077     3.9      15   19.2    21   16.0
3 10 HG     94   .120  13.14   3484    13.360   13109      99     238   1135   .147    14.5      35  166.8    51   10.0
4 16 HG     51   .130  12.59   1258    12.775    8119      35     167    265   .077     2.7      13   20.4    21   16.0
5 19 HG     41   .090  12.18    412    12.314    5715      21      84     63   .057     1.2       5    3.6     6   19.0
6 16 HG     46   .130  12.59   1258    12.770    8119      32     167    266   .077     2.4      13   20.4    21   16.0
7  3 HG     51   .640  13.00   1707    13.695   18693      75    1760    771   .113     8.5     199   87.2    74    3.0
8 16 HG     46   .140  12.72   1244    12.910    8119      31     178    270   .077     2.4      14   20.8    21   16.0
9 C.T.    1935   .190   5.97     85     8.250    1633     414      76      6   .143    59.2      11     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.5      16   15.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     4.3      17   14.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     4.4      17   15.1
FOUR CYCLE COMPOSITE =                  HC= NDIR 0.35(     4.3) + 0.65(     4.4) =     4.328   GM/BHP HR
                                        CO= NDIR 0.35(    16.8) + 0.65(    16.6) =    16.632   GM/BHP HR
                                        NO2=NDIR 0.35(    14.2) + 0.65(    15.1) =    14.809   GM/BHP HR
                                                             CORRECTED NO2 =    16.310   GM/BHP HR
                                                                      BSFC =      .731   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.        WEIGHTED GM/HR          MAN.
MODE      HC-FID   CO     CO2  NO-CL    CARBON    CONS.     HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL   HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE    3597   .910  10.80     50    12.065    1701      50     259      2   .232    11.6      60     .5     0   19.2
2 16 HG   1004   .130  12.31    862    12.540    8119      65     170    185   .077     5.0      13   14.3    21   16.0
3 10 HG   1796   .120  13.14   3900    13.440   13109     175     236   1101   .147    25.8      35  161.9    51   10.0
4 16 HG    715   .120  12.59   1075    12.782    8119      45     154    227   .077     3.5      12   17.5    21   16.0
5 19 HG    334   .080  12.05    287    12.163    5715      16      76     45   .057      .9       4    2.6     6   19.0
6 16 HG    692   .120  12.45   1050    12.639    8119      44     156    224   .077     3.4      12   17.2    21   16.0
7  3 HG    811   .710  13.00   1575    13.791   18693     110    1939    707   .113    12.4     219   79.9    74    3.0
8 16 HG    627   .140  12.72   1162    12.923    8119      39     178    242   .077     3.0      14   18.7    21   16.0
9 C.T.   23490   .200   5.74     25     8.289    1633     463      80      2   .143    66.2      11     .2     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.8      17   13.8
1 IDLE    3597   .910  10.80     50    12.065    1701      50     259      2   .232    11.6      60     .5     0   19.2
2 16 HG    939   .140  12.59   1087    12.824    8119      59     179    228   .077     4.6      14   17.6    21   16.0
3 10 HG   1752   .140  13.14   3550    13.455   13109     171     276   1148   .147    25.1      41  168.8    51   10.0
4 16 HG    671   .120  12.59   1150    12.777    8119      43     154    243   .077     3.3      12   18.7    21   16.0
5 19 HG    334   .080  12.31    300    12.423    5715      15      74     46   .057      .9       4    2.6     6   19.0
6 16 HG    643   .120  12.59   1150    12.774    8119      44     154    243   .077     3.4      12   18.7    21   16.0
7  3 HG    721   .670  13.00   1675    13.742   18693      98    1836    754   .113    11.1     207   85.2    74    3.0
8 16 HG    604   .130  12.59   1200    12.780    8119      38     167    253   .077     3.0      13   19.5    21   16.0
9 C.T.   23079   .180   5.81     36     8.298    1633     454      72      2   .143    64.9      10     .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.7      17   14.7
1 IDLE    3286  1.080  11.66     50    13.069    1701      43     284      2   .232     9.9      66     .5     0   19.2
2 16 HG    982   .130  12.45   1150    12.678    8119      63     168    245   .077     4.8      13   18.8    21   16.0
3 10 HG   1705   .130  13.00   3600    13.300   13109     168     259   1178   .147    24.7      38  173.2    51   10.0
4 16 HG    715   .130  12.59   1262    12.792    8119      45     167    266   .077     3.5      13   20.5    21   16.0
5 19 HG    334   .120  12.05    325    12.203    5715      16     114     51   .057      .9       6    2.9     6   19.0
6 16 HG    738   .130  12.59   1325    12.794    8119      47     167    279   .077     3.6      13   21.5    21   16.0
7  3 HG    721   .650  13.00   1700    13.722   18693      98    1784    767   .113    11.1     202   86.6    74    3.0
8 16 HG    644   .140  12.72   1350    12.925    8119      41     178    282   .077     3.1      14   21.7    21   16.0
9 C.T.   22782   .220   6.05     32     8.548    1633     435      85      2   .143    62.2      12     .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.5      17   15.3
1 IDLE    3286  1.080  11.66     50    13.069    1701      43     284      2   .232     9.9      66     .5     0   19.2
2 16 HG   1028   .150  12.59   1175    12.843    8119      65     192    247   .077     5.0      15   19.0    21   16.0
3 10 HG   1751   .120  13.14   3600    13.435   13109     171     237   1166   .147    25.1      35  171.4    51   10.0
4 16 HG    715   .130  12.59   1225    12.792    8119      45     167    258   .077     3.5      13   19.9    21   16.0
5 19 HG    356   .090  12.18    375    12.306    5715      17      84     58   .057      .9       5    3.3     6   19.0
6 16 HG    734   .130  12.59   1262    12.794    8119      47     167    266   .077     3.6      13   20.5    21   16.0
7  3 HG    721   .640  13.00   1675    13.712   18693      98    1758    756   .113    11.1     199   85.4    74    3.0
8 16 HG    582   .140  12.72   1250    12.918    8119      37     178    261   .077     2.8      14   20.1    21   16.0
9 C.T.   22409   .190   5.97     38     8.401    1633     436      75      2   .143    62.3      11     .4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.5      16   15.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     5.7      17   14.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     5.5      16   15.2
FOUR CYCLE COMPOSITE =                  HC= FID  0.35(     5.7) + 0.65(     5.5) =     5.582   GM/BHP HR
                                        CO= NDIR 0.35(    16.7) + 0.65(    16.5) =    16.561   GM/BHP HR
                                        NO2-CL   0.35(    14.3) + 0.65(    15.2) =    14.873   GM/BHP HR
                                                             CORRECTED NO2 =    16.381   GM/BHP HR
                                                                      BSFC =      .731   LB/BHP HR
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                              TABLE B-14 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-0   TEST-4  RUN-1     1972 STANDARD ENGINE  03-29-73        K =1.023      HUM = 82.8  GR/LB
-------------------------------------------------------------------------------------------------------------------------------
MODE            CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR       WT.        WEIGHTED GM/HR            MAN.
                 HC      CO      CO2     NO   CARBON    CONS.      HC      CO     NO2    FACT.     HC      CO     NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE          216   2.250   10.73      97   13.213     1683      30     579       9    .232     6.9    134     1.0     0   18.6
2 30 PCT T       94    .150   11.69    1609   11.942     8981      76     228     401    .077     5.9     18    30.8    29   14.6
3 60 PCT T      112    .180   12.20    3387   12.501    13608     132     396    1224    .147    19.4     58   179.9    58    9.0
4 30 PCT T       84    .160   11.81    1995   12.061     8981      68     241     493    .077     5.2     19    38.0    29   14.6
5 10 PCT T       54    .120   11.50     502   11.678     5897      29     122      84    .057     1.7      7     4.8    10   18.9
6 30 PCT T       76    .160   12.07    2179   12.318     8981      60     236     526    .077     4.6     18    40.5    29   14.6
7 90 PCT T       95   2.410   11.69    1796   14.209    19868     144    6810     834    .113    16.2    770    94.3    86    2.4
8 30 PCT T       70    .170   11.94    2198   12.186     8981      56     253     538    .077     4.3     19    41.4    29   14.6
9 C.T.         2297    .290    7.08      50    9.851     1361     343      81       2    .143    49.0     12      .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.1     38    15.6
1 IDLE          216   2.250   10.73      97   13.213     1683      30     579       9    .232     6.9    134     1.0     0   18.6
2 30 PCT T       93    .160   11.84    1660   12.100     8981      75     240     409    .077     5.7     18    31.5    29   14.6
3 60 PCT T      115    .200   12.30    3610   12.624    13608     134     435    1292    .147    19.7     64   189.9    58    9.0
4 30 PCT T       72    .170   11.94    2151   12.188     8981      57     253     526    .077     4.4     19    40.5    29   14.6
5 10 PCT T       60    .120   11.57     565   11.755     5897      33     122      92    .057     1.9      7     5.3    10   18.9
6 30 PCT T       84    .160   11.94    2222   12.191     8981      67     238     543    .077     5.1     18    41.8    29   14.6
7 90 PCT T       92   2.210   11.81    1770   14.119    19868     140    6282     827    .113    15.8    710    93.4    86    2.4
8 30 PCT T       65    .160   12.07    2319   12.300     8981      51     236     562    .077     3.9     18    43.3    29   14.6
9 C.T.         2168    .300    7.34      50    9.981     1361     319      83       2    .143    45.7     12      .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.9     36    16.2
1 IDLE          190   2.750   11.25      95   14.205     1683      24     658       9    .232     5.6    153      .9     0   18.6
2 30 PCT T       84    .160   12.04    2098   12.291     8981      66     236     509    .077     5.1     18    39.2    29   14.6
3 60 PCT T      102    .200   12.32    3617   12.630    13608     119     435    1294    .147    17.4     64   190.2    58    9.0
4 30 PCT T       73    .160   12.07    2045   12.309     8981      58     236     495    .077     4.4     18    38.1    29   14.6
5 10 PCT T       45    .120   11.69     511   11.859     5897      24     121      84    .057     1.4      7     4.8    10   18.9
6 30 PCT T       73    .150   12.06    2344   12.289     8981      58     221     569    .077     4.4     17    43.8    29   14.6
7 90 PCT T       76   1.600   11.88    1604   13.562    19868     120    4735     780    .113    13.6    535    88.2    86    2.4
8 30 PCT T       72    .170   12.04    2185   12.288     8981      57     251     530    .077     4.4     19    40.8    29   14.6
9 C.T.         2168    .320    7.51      49   10.171     1361     313      86       2    .143    44.8     12      .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.7     31    16.1
1 IDLE          190   2.750   11.25      95   14.205     1683      24     658       9    .232     5.6    153      .9     0   18.6
2 30 PCT T       84    .170   11.94    1928   12.201     8981      67     253     471    .077     5.1     19    36.3    29   14.6
3 60 PCT T      112    .220   12.07    3651   12.411    13608     133     487    1329    .147    19.5     72   195.4    58    9.0
4 30 PCT T       79    .190   11.94    2080   12.215     8981      63     282     508    .077     4.8     22    39.1    29   14.6
5 10 PCT T       60    .130   11.69     549   11.885     5897      32     130      99    .057     1.8      7     5.6    10   18.9
6 30 PCT T       74    .180   11.94    2151   12.200     8981      59     268     526    .077     4.5     21    40.5    29   14.6
7 90 PCT T       74   1.720   11.88    1645   13.680    19868     116    5096     793    .113    13.1    570    89.6    86    2.4
8 30 PCT T       79    .170   12.02    2210   12.275     8981      62     251     537    .077     4.8     19    41.3    29   14.6
9 C.T.         2211    .360    7.42      50   10.168     1361     320      97       2    .143    45.7     14      .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.8     32    16.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     4.0     37    15.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     3.7     31    16.2
FOUR CYCLE COMPOSITE -
                                       HC- NDIR 0.35(      4.0) + 0.65(      3.7) =    3.830   GM/BHP HR
                                       CO- NDIR 0.35(     37.2) + 0.65(     31.5) =   33.460   GM/BHP HR
                                       NO2-NDIR 0.35(     15.9) + 0.65(     16.2) =   16.076   GM/BHP HR
                                                             CORRECTED NO2 =   16.451   GM/BHP HR
                                                                      BSFC =     .632   LB/BHP HR


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MODE            CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR       WT.        WEIGHTED GM/HR            MAN.
               HC-FID    CO      CO2   NO-CL  CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID    CO   NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE         3584   2.250   10.73      37   13.338     1683      45     573       2    .232    10.5    133      .4     0   18.6
2 30 PCT T     1087    .150   11.69    1612   11.949     8981      82     228     402    .077     6.3     18    31.0    29   14.6
3 60 PCT T     1605    .180   12.20    3000   12.540    13608     174     395    1081    .147    25.6     58   158.9    58    9.0
4 30 PCT T     1072    .160   11.81    2025   12.077     8981      80     240     500    .077     6.1     19    38.5    29   14.6
5 10 PCT T      965    .120   11.50     506   11.667     5897      24     123      85    .057     1.3      7     4.8    10   18.9
6 30 PCT T     1064    .160   12.07    2206   12.337     8981      78     235     533    .077     6.0     18    41.1    29   14.6
7 90 PCT T     1458   2.410   11.69    1787   14.246    19868     203    6789     827    .113    23.0    767    93.5    86    2.4
8 30 PCT T      934    .170   11.94    2237   12.203     8981      69     253     547    .077     5.3     19    42.1    29   14.6
9 C.T.        25204    .290    7.08      20    9.891     1361     347      81       1    .143    49.6     12      .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.8     38    14.8
1 IDLE         3584   2.250   10.73      37   13.338     1683      45     573       2    .232    10.5    133      .4     0   18.6
2 30 PCT T     1133    .160   11.84    1670   12.113     8981      84     240     411    .077     6.5     18    31.7    29   14.6
3 60 PCT T     1651    .200   12.30    3700   12.665    13608     177     434    1320    .147    26.1     64   194.0    58    9.0
4 30 PCT T      974    .170   11.94    2225   12.208     8981      72     253     543    .077     5.5     19    41.8    29   14.6
5 10 PCT T      954    .120   11.57     560   11.735     5897      23     122      93    .057     1.3      7     5.3    10   18.9
6 30 PCT T     1045    .160   11.94    2260   12.205     8981      77     238     552    .077     5.9     18    42.5    29   14.6
7 90 PCT T     1288   2.210   11.81    1787   14.149    19868     181    6269     833    .113    20.4    708    94.1    86    2.4
8 30 PCT T      913    .160   12.07    2357   12.321     8981      67     236     570    .077     5.1     18    43.9    29   14.6
9 C.T.        23983    .300    7.34      22   10.038     1361     325      82       1    .143    46.5     12      .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.6     36    16.4
1 IDLE         3468   2.750   11.25      48   14.347     1683      41     652       2    .232     9.4    151      .4     0   18.6
2 30 PCT T     1171    .160   12.04    2130   12.319     8981      87     236     516    .077     6.7     18    39.7    29   14.6
3 60 PCT T     1646    .200   12.32    3675   12.605    13608     177     433    1309    .147    26.0     64   192.4    58    9.0
4 30 PCT T      891    .160   12.07    2075   12.319     8981      65     236     502    .077     5.0     18    38.7    29   14.6
5 10 PCT T      841    .120   11.69     515   11.851     5897      20     121      85    .057     1.2      7     4.8    10   18.9
6 30 PCT T     1046    .150   12.06    2406   12.315     8981      76     221     583    .077     5.9     17    44.9    29   14.6
7 90 PCT T      990   1.600   11.88    1612   13.579    19868     145    4729     783    .113    16.4    534    88.5    86    2.4
8 30 PCT T      824    .170   12.04    2231   12.292     8981      60     251     541    .077     4.6     19    41.7    29   14.6
9 C.T.        22450    .320    7.51      27   10.125     1361     308      87       1    .143    44.1     12      .2     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.3     30    16.3
1 IDLE         3468   2.750   11.25      48   14.347     1683      41     652       2    .232     9.4    151      .4     0   18.6
2 30 PCT T     1134    .170   11.94    1962   12.223     8981      83     252     479    .077     6.4     19    36.9    29   14.6
3 60 PCT T     1637    .220   12.07    3775   12.459    13608     179     486    1369    .147    26.3     71   201.3    58    9.0
4 30 PCT T      956    .190   11.94    2137   12.226     8981      70     282     521    .077     5.4     22    40.1    29   14.6
5 10 PCT T      944    .130   11.69     600   11.869     5897      22     131      99    .057     1.3      7     5.6    10   18.9
6 30 PCT T     1001    .180   11.94    2218   12.220     8981      74     267     541    .077     5.7     21    41.7    29   14.6
7 90 PCT T      985   1.720   11.88    1662   13.699    19868     143    5039     800    .113    16.1    569    90.4    86    2.4
8 30 PCT T      823    .170   12.02    2262   12.272     8981      60     251     550    .077     4.6     19    42.3    29   14.6
9 C.T.        21868    .360    7.42      27    9.967     1361     299      99       1    .143    42.7     14      .2     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.3     32    16.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     4.7     37    15.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     4.3     31    16.5
FOUR CYCLE COMPOSITE -
                                       HC- FID  0.35(      4.7) + 0.65(      4.3) =    4.442   GM/BHP HR
                                       CO- NDIR 0.35(     37.0) + 0.65(     31.4) =   33.360   GM/BHP HR
                                       NO2-CL   0.35(     15.6) + 0.65(     16.5) =   16.164   GM/BHP HR
                                                             CORRECTED NO2 =   16.541   GM/BHP HR
                                                                      BSFC =     .632   LB/BHP HR
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                         TABLE B-15 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-D   TEST-3  RUN-2    1972 STANDARD ENGINE  03-29-73      K =1.023      HUM = 82.8  GR/LB
----------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR               MAN.
MODE          HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC        CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        173   2.310  10.90    122   13.397    1683       23     586      5    .232     5.4      136     1.2    0    18.6
2 30 PCT T     86    .150  11.62   1922   11.863    8981       70     229    483    .077     5.4       18    37.2   29    14.6
3 60 PCT T     98    .210  11.81   3685   12.126   13608      119     476   1373    .147    17.5       70   201.8   58     9.0
4 30 PCT T     65    .140  11.38   2151   11.590    8981       54     219    553    .077     4.2       17    42.6   29    14.6
5 10 PCT T     39    .120  11.08    580   11.242    5897       22     127    101    .057     1.3        7     5.8   10    18.4
6 30 PCT T     56    .140  11.44   2290   11.643    8981       48     218    586    .077     3.7       17    45.2   29    14.6
7 90 PCT T     79   2.450  11.32   1967   13.855   19868      122    7097    936    .113    13.8      802   105.8   86     2.4
8 30 PCT T     51    .160  11.81   2445   12.025    8981       41     241    606    .077     3.2       19    46.7   29    14.6
9 C.T.       2360    .300   7.34    115   10.189    1361      340      81      5    .143    48.7       12      .7    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       3.7       40    17.6
1 IDLE        173   2.310  10.90    122   13.397    1683       23     586      5    .232     5.4      136     1.2    0    18.6
2 30 PCT T     79    .180  12.07   1967   12.335    8981       62     265    475    .077     4.8       20    36.6   29    14.6
3 60 PCT T     94    .230  12.20   3967   12.532   13608      110     505   1430    .147    16.2       74   210.2   58     9.0
4 30 PCT T     64    .170  11.81   2174   12.049    8981       52     256    538    .077     4.0       20    41.4   29    14.6
5 10 PCT T     45    .130  11.57    659   11.799    5897       24     132    110    .057     1.4        8     6.3   10    18.4
6 30 PCT T     56    .170  11.94   2344   12.170    8981       45     253    587    .077     3.4       20    45.2   29    14.6
7 90 PCT T    102   3.050  11.57   2104   14.730   19868      149    8310    942    .113    16.8      939   106.5   86     2.4
8 30 PCT T     70    .160  11.73   2475   11.966    8981       57     243    617    .077     4.4       19    47.5   29    14.6
9 C.T.       2297    .300   7.42    104   10.201    1361      331      81      5    .143    47.3       12      .7    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       3.7       45    17.9
1 IDLE        505   2.850  11.08    167   14.475    1683       63     669      6    .232    14.7      155     1.5    0    18.6
2 30 PCT T     84    .160  11.81   2394   12.061    8981       68     241    592    .077     5.2       19    45.6   29    14.6
3 60 PCT T     93    .240  12.20   4004   12.540   13608      109     526   1442    .147    16.0       77   212.0   58     9.0
4 30 PCT T     63    .170  11.85   2419   12.088    8981       51     255    597    .077     3.9       20    45.9   29    14.6
5 10 PCT T     37    .120  11.69    635   11.850    5897       20     121    105    .057     1.1        7     6.0   10    18.4
6 30 PCT T     54    .160  11.94   2445   12.158    8981       43     239    600    .077     3.3       18    46.2   29    14.6
7 90 PCT T     70   1.880  11.69   1930   13.646   19868      110    5529    933    .113    12.4      625   105.4   86     2.4
8 30 PCT T     58    .160  11.85   2610   12.073    8981       47     240    645    .077     3.6       19    49.6   29    14.6
9 C.T.       2340    .350   7.60    110   10.477    1361      328      92      5    .143    46.9       13      .7    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       3.9       34    18.5
1 IDLE        505   2.850  11.08    167   14.475    1683       63     669      6    .232    14.7      155     1.5    0    18.6
2 30 PCT T     74    .170  11.87   2140   12.120    8981       59     254    526    .077     4.6       20    40.5   29    14.6
3 60 PCT T     86    .230  12.26   3945   12.585   13608      103     502   1416    .147    15.1       74   208.2   58     9.0
4 30 PCT T     60    .170  11.87   2419   12.105    8981       48     255    596    .077     3.7       20    45.9   29    14.6
5 10 PCT T     41    .120  11.57    635   11.734    5897       22     122    106    .057     1.3        7     6.0   10    18.4
6 30 PCT T     60    .170  11.81   2485   12.095    8981       48     256    615    .077     3.7       20    47.4   29    14.6
7 90 PCT T     74   2.430  11.57   2080   14.080   19868      113    6926    974    .113    12.7      783   110.1   86     2.4
8 30 PCT T     54    .170  11.94   2548   12.160    8981       43     253    624    .077     3.3       20    48.1   29    14.6
9 C.T.       2297    .380   7.69    122   10.551    1361      320      99      5    .143    45.8       14      .7    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       3.8       40    18.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       3.7       42    17.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       3.8       37    18.5
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.7) + 0.65(     3.8) =     3.802   GM/BHP HR
                                        CO- NDIR 0.35(    42.4) + 0.65(    37.3) =    39.078   GM/BHP HR
                                        NO2-NDIR 0.35(    17.8) + 0.65(    18.5) =    18.218   GM/BHP HR
                                                             CORRECTED NO2 =    18.643   GM/BHP HR
                                                                      BSFC =      .632   LB/BHP HR
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              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR               MAN.
MODE         HC-FID    CO    CO2  NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE       3007   2.310  10.90     45   13.511    1683       37     581      2    .232     8.7      135      .4    0    18.6
2 30 PCT T   1109    .150  11.62   1800   11.881    8981       84     229    452    .077     6.5       18    34.8   29    14.6
3 60 PCT T   1489    .210  11.81   3500   12.169   13608      167     474   1299    .147    24.5       70   191.0   58     9.0
4 30 PCT T    885    .140  11.38   2032   11.609    8981       68     219    522    .077     5.3       17    40.2   29    14.6
5 10 PCT T    441    .120  11.08    525   11.244    5897       23     127     91    .057     1.3        7     5.2   10    18.4
6 30 PCT T    974    .140  11.44   2200   11.677    8981       75     217    562    .077     5.8       17    43.3   29    14.6
7 90 PCT T   1443   2.450  11.32   1850   13.914   19868      206    7067    877    .113    23.3      799    99.1   86     2.4
8 30 PCT T    900    .160  11.81   2312   12.060    8981       67     241    572    .077     5.2       19    44.0   29    14.6
9 C.T.      24981    .300   7.34     18   10.938    1361      355      80      1    .143    50.8       11      .1    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       4.7       39    16.6
1 IDLE       3007   2.310  10.90     45   13.511    1683       37     581      2    .232     8.7      135      .4    0    18.6
2 30 PCT T   1102    .180  12.07   1850   12.360    8981       80     264    446    .077     6.2       20    34.4   29    14.6
3 60 PCT T   1639    .230  12.20   3800   12.594   13608      177     502   1363    .147    26.0       74   200.4   58     9.0
4 30 PCT T    978    .170  11.81   2050   12.078    8981       73     255    506    .077     5.6       20    39.0   29    14.6
5 10 PCT T    488    .130  11.57    600   11.749    5897       24     132    100    .057     1.4        8     5.7   10    18.4
6 30 PCT T   1090    .170  11.94   2275   12.219    8981       80     252    555    .077     6.2       19    42.7   29    14.6
7 90 PCT T   1816   3.050  11.57   1963   14.802   19868      244    8270    875    .113    27.6      934    98.9   86     2.4
8 30 PCT T    888    .160  11.73   2300   11.979    8981       67     242    573    .077     5.1       19    44.1   29    14.6
9 C.T.      27000    .300   7.42     18   10.420    1361      353      79      1    .143    50.4       11      .1    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       5.0       45    16.8
1 IDLE       4290   2.850  11.08     50   14.359    1683       50     675      2    .232    11.7      157      .5    0    18.6
2 30 PCT T   1288    .160  11.81   2250   12.099    8981       96     240    554    .077     7.4       18    42.7   29    14.6
3 60 PCT T   1650    .240  12.20   3800   12.605   13608      178     523   1362    .147    26.2       77   200.2   58     9.0
4 30 PCT T   1045    .170  11.85   2300   12.124    8981       77     254    565    .077     6.0       20    43.6   29    14.6
5 10 PCT T    444    .120  11.69    570   11.854    5897       22     121     94    .057     1.3        7     5.4   10    18.4
6 30 PCT T   1023    .160  11.94   2325   12.202    8981       75     238    568    .077     5.8       18    43.7   29    14.6
7 90 PCT T   1171   1.880  11.69   1775   13.687   19868      170    5513    855    .113    19.2      623    96.7   86     2.4
8 30 PCT T    889    .160  11.85   2475   12.099    8981       66     240    610    .077     5.1       18    47.0   29    14.6
9 C.T.      26731    .350   7.60     18   10.623    1361      342      91      1    .143    49.0       13      .1    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       4.8       34    17.3
1 IDLE       4290   2.850  11.08     50   14.359    1683       50     675      2    .232    11.7      157      .5    0    18.6
2 30 PCT T   1245    .170  11.87   2137   12.169    8981       92     254    524    .077     7.1       20    40.3   29    14.6
3 60 PCT T   1629    .230  12.26   3800   12.653   13608      175     500   1357    .147    25.7       73   199.5   58     9.0
4 30 PCT T    978    .170  11.87   2325   12.138    8981       72     254    571    .077     5.6       20    44.0   29    14.6
5 10 PCT T    432    .120  11.57    562   11.733    5897       22     122     94    .057     1.2        7     5.3   10    18.4
6 30 PCT T   1044    .170  11.81   2350   12.084    8981       78     255    580    .077     6.0       20    44.6   29    14.6
7 90 PCT T   1401   2.430  11.57   1937   14.190   19868      197    6897    904    .113    22.2      779   102.1   86     2.4
8 30 PCT T    890    .170  11.94   2400   12.199    8981       65     253    587    .077     5.0       19    45.2   29    14.6
9 C.T.      25742    .380   7.69     18   10.699    1361      330      98      1    .143    47.1       14      .1    0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------       4.8       40    17.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       4.9       42    16.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       4.8       37    17.4
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.9) + 0.65(     4.8) =     4.791   GM/BHP HR
                                        CO- NDIR 0.35(    42.1) + 0.65(    37.2) =    38.954   GM/BHP HR
                                        NO2-CL   0.35(    16.7) + 0.65(    17.4) =    17.141   GM/BHP HR
                                                             CORRECTED NO2 =    17.541   GM/BHP HR
                                                                      BSFC =      .632   LB/BHP HR
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                        TABLE B-16 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-B   TEST-3  RUN-3    1972 STANDARD ENGINE  03-30-73      K =1.023      HUM = 82.8  GR/LB
----------------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2    NO   CARBON   CONS.     HC      CO    NO2   FACT.   HC       CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        179  2.920  11.32    110  14.433    1683      23     688      4   .232    5.2     160    1.0     0   18.6
2 30 PCT T     75   .130  12.48   1544  12.691    8981      57     186    363   .077    4.4      14   27.9    29   14.6
3 60 PCT T     89   .130  12.99   3452  13.216   13608      99     270   1180   .147   14.5      40  173.5    58    9.0
4 30 PCT T     65   .140  12.72   2012  12.930    8981      44     196    464   .077    3.4      15   35.7    29   14.6
5 10 PCT T     42   .150  12.59    590  12.785    5897      21     140     90   .057    1.2       8    5.1    10   18.4
6 30 PCT T     51   .150  12.59   1835  12.795    8981      39     213    428   .077    3.0      16   32.9    29   14.6
7 90 PCT T     65  2.090  12.48   1792  14.640   19868      95    5729    807   .113   10.8     647   91.2    86    2.4
8 30 PCT T     42   .170  12.86   2175  13.075    8981      31     236    496   .077    2.4      18   38.2    29   14.6
9 C.T.       2384   .370   7.78     73  10.725    1361     327      95      3   .143   46.7      14     .4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    3.3      34   14.7
1 IDLE        179  2.920  11.32    110  14.433    1683      23     680      4   .232    5.2     160    1.0     0   18.6
2 30 PCT T     65   .150  12.59   1990  12.810    8981      49     212    463   .077    3.8      16   35.7    29   14.6
3 60 PCT T     80   .140  12.86   3685  13.086   13608      90     294   1272   .147   13.2      43  187.0    58    9.0
4 30 PCT T     56   .160  12.59   2058  12.810    8981      42     227    479   .077    3.3      17   36.9    29   14.6
5 10 PCT T     37   .120  12.48    629  12.640    5897      19     113     97   .057    1.1       6    5.6    10   18.4
6 30 PCT T     47   .150  12.59   2151  12.791    8981      36     213    501   .077    2.7      16   38.6    29   14.6
7 90 PCT T     56  1.880  12.48   1771  14.420   19868      83    5232    810   .113    9.4     591   91.5    86    2.4
8 30 PCT T     37   .180  12.72   2151  12.940    8981      28     252    496   .077    2.1      19   38.2    29   14.6
9 C.T.       2254   .360   7.96     73  10.759    1361     308      92      3   .143   44.1      13     .4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    3.1      32   15.7
1 IDLE        207  3.300  11.57    110  15.094    1683      25     743      4   .232    5.8     172     .9     0    0.0
2 30 PCT T     75   .180  12.59   1990  12.851    8981      57     254    462   .077    4.4      20   35.6    29    0.0
3 60 PCT T     84   .180  12.99   3584  13.261   13608      93     373   1221   .147   13.7      55  179.5    58    0.0
4 30 PCT T     56   .160  12.59   2128  12.810    8981      42     227    495   .077    3.3      17   38.1    29    0.0
5 10 PCT T     37   .120  12.48    599  12.640    5897      19     113     93   .057    1.1       6    5.3    10    0.0
6 30 PCT T     51   .150  12.59   2151  12.795    8981      39     213    501   .077    3.0      16   38.6    29    0.0
7 90 PCT T     68  2.330  12.48   1900  14.883   19868      98    6283    842   .113   11.1     710   95.2    86    0.0
8 30 PCT T     47   .160  12.59   2175  12.801    8981      36     227    507   .077    2.7      17   39.0    29    0.0
9 C.T.       2254   .410   8.28     73  11.124    1361     298     101      3   .143   42.6      14     .4     0    0.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    3.2      37   15.6
1 IDLE        207  3.300  11.57    110  15.094    1683      25     743      4   .232    5.8     172     .9     0    0.0
2 30 PCT T     75   .140  12.59   2175  12.811    8981      57     198    506   .077    4.4      15   39.0    29    0.0
3 60 PCT T     70   .170  12.86   3617  13.106   13608      78     357   1247   .147   11.5      52  183.3    58    0.0
4 30 PCT T     51   .160  12.59   2198  12.805    8981      39     227    512   .077    3.0      17   39.4    29    0.0
5 10 PCT T     37   .120  12.32    599  12.480    5897      19     115     94   .057    1.1       7    5.4    10    0.0
6 30 PCT T     51   .150  12.59   2271  12.795    8981      39     213    529   .077    3.0      16   40.8    29    0.0
7 90 PCT T     61  1.940  12.32   1857  14.326   19868      91    5435    855   .113   10.3     614   96.6    86    0.0
8 30 PCT T     41   .190  12.59   2247  12.824    8981      31     269    522   .077    2.4      21   40.2    29    0.0
9 C.T.       2254   .570   8.10     73  11.109    1361     298     141      3   .143   42.7      20     .4     0    0.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    3.0      34   16.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    3.2      33   15.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    3.1      36   15.9
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.2) + 0.65(     3.1) =   3.136   GM/BHP HR
                                        CO- NDIR 0.35(    32.8) + 0.65(    35.5) =  34.571   GM/BHP HR
                                        NO2-NDIR 0.35(    15.2) + 0.65(    15.9) =  15.645   GM/BHP HR
                                                              CORRECTED NO2 =  16.010   GM/BHP HR
                                                                       BSFC =    .632   LB/BHP HR


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             CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE        HC-FID    CO     CO2  NO-CL  CARBON   CONS.     HC      CO    NO2   FACT.  HC-FID    CO  NO2-CL  HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       3667  2.920  11.32     25  14.607    1683      42     680      1   .232    9.8     158     .2     0   18.6
2 30 PCT T   1072   .130  12.48   1100  12.717    8981      76     185    258   .077    5.8      14   19.9    29   14.6
3 60 PCT T   1615   .130  12.99   2530  13.281   13608     165     269    861   .147   24.3      40  126.5    58    9.0
4 30 PCT T   1074   .140  12.72   1500  12.967    8981      74     196    345   .077    5.7      15   26.6    29   14.6
5 10 PCT T    492   .150  12.59    425  12.789    5897      23     140     65   .057    1.3       8    3.7    10   18.4
6 30 PCT T    939   .150  12.59   1337  12.834    8981      66     212    311   .077    5.1      16   23.9    29   14.6
7 90 PCT T   1362  2.090  12.48   1263  14.706   19868     184    5709    566   .113   20.8     645   64.0    86    2.4
8 30 PCT T    964   .170  12.86   1563  13.126    8981      66     235    355   .077    5.1      18   27.3    29   14.6
9 C.T.      24949   .370   7.78     18  10.645    1361     319      96      1   .143   45.6      14     .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    4.5      34   10.6
1 IDLE       3667  2.920  11.32     25  14.607    1683      42     680      1   .232    9.8     158     .2     0   18.6
2 30 PCT T   1118   .150  12.59   1437  12.852    8981      78     212    333   .077    6.0      16   25.7    29   14.6
3 60 PCT T   1546   .140  12.86   2730  13.155   13608     160     293    938   .147   23.5      43  137.8    58    9.0
4 30 PCT T    961   .160  12.59   1500  12.846    8981      67     226    348   .077    5.2      17   26.8    29   14.6
5 10 PCT T    447   .120  12.48    450  12.645    5897      21     113     70   .057    1.2       6    4.0    10   18.4
6 30 PCT T    961   .150  12.59   1550  12.836    8981      67     212    360   .077    5.2      16   27.7    29   14.6
7 90 PCT T   1201  1.880  12.48   1232  14.480   19868     165    5211    561   .113   18.6     589   63.4    86    2.4
8 30 PCT T    851   .180  12.72   1525  12.985    8981      59     251    350   .077    4.5      19   27.0    29   14.6
9 C.T.      24770   .360   7.96     18  10.797    1361     312      92      1   .143   44.6      13     .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    4.3      32   11.3
1 IDLE       3959  3.300  11.57     37  15.266    1683      44     735      1   .232   10.1     170     .3     0    0.0
2 30 PCT T   1186   .180  12.59   1410  12.889    8981      83     253    326   .077    6.4      20   25.1    29    0.0
3 60 PCT T   1526   .180  12.99   2600  13.323   13608     156     371    882   .147   22.9      55  129.6    58    0.0
4 30 PCT T    894   .160  12.59   1525  12.839    8981      63     226    354   .077    4.8      17   27.3    29    0.0
5 10 PCT T    391   .120  12.48    425  12.639    5897      18     113     66   .057    1.0       6    3.8    10    0.0
6 30 PCT T    917   .150  12.59   1538  12.832    8981      64     212    357   .077    4.9      16   27.5    29    0.0
7 90 PCT T   1367  2.330  12.48   1400  14.949   19868     184    6255    618   .113   20.8     707   69.8    86    0.0
8 30 PCT T    827   .160  12.59   1587  12.833    8981      58     226    369   .077    4.5      17   28.4    29    0.0
9 C.T.      25011   .410   8.28     18  11.191    1361     304     101      1   .143   43.5      14     .1     0    0.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    4.3      37   11.3
1 IDLE       3959  3.300  11.57     37  15.266    1683      44     735      1   .232   10.1     170     .3     0    0.0
2 30 PCT T   1185   .140  12.59   1562  12.848    8981      83     198    362   .077    6.4      15   27.9    29    0.0
3 60 PCT T   1569   .170  12.86   1700  13.187   13608     162     354    582   .147   23.8      52   85.6    58    0.0
4 30 PCT T    945   .160  12.59   1600  12.844    8981      66     226    371   .077    5.1      17   28.6    29    0.0
5 10 PCT T    401   .120  12.32    425  12.480    5897      19     115     67   .057    1.1       7    3.8    10    0.0
6 30 PCT T    961   .150  12.59   1662  12.836    8981      67     212    386   .077    5.2      16   29.7    29    0.0
7 90 PCT T   1200  1.940  12.32   1320  14.380   19868     166    5414    605   .113   18.7     612   68.4    86    0.0
8 30 PCT T    822   .190  12.59   1650  12.862    8981      57     268    383   .077    4.4      21   29.5    29    0.0
9 C.T.      24196   .570   8.10     18  11.090    1361     297     141      1   .143   42.5      20     .1     0    0.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    4.2      34    9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    4.4      33   10.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    4.3      35   10.6
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.4) + 0.65(     4.3) =   4.308   GM/BHP HR
                                        CO- NDIR 0.35(    32.6) + 0.65(    35.3) =  34.387   GM/BHP HR
                                        NO2-CL   0.35(    10.9) + 0.65(    10.6) =  10.711   GM/BHP HR
                                                              CORRECTED NO2 =  10.961   GM/BHP HR
                                                                       BSFC =    .632   LB/BHP HR
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                  TABLE B-17 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-1   TEST-8   RUN-1    EGR-AIR-CAT.          04-17-73      K =1.011      HUM = 78.7  GR/LB
------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR           MAN.
MODE            HC      CO     CO2      NO     CARBON   CONS.     HC       CO      NO2    FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE          44    .010    9.42      72     9.478    1692       8        4        4    .232     2.0        1     1.0     0   18.2
2 30 PCT T      46    .010   10.06    1114    10.120    9390      46       19      343    .077     3.5        1    26.4    29   19.3
3 60 PCT T      45    .020   10.85     830    10.919   16965      76       63      428    .147    11.1        9    62.9    57    9.3
4 30 PCT T      41    .010   10.17    1294    10.224    9390      41       19      395    .077     3.1        1    30.4    29   19.3
5 10 PCT T      27    .010    9.21     412     9.249    6623      21       14       98    .057     1.2        1     5.6    10   17.9
6 30 PCT T      37    .010   10.17    1258    10.220    9390      37       19      384    .077     2.8        1    29.5    29   19.3
7 90 PCT T      63   4.190   12.07     584    16.278   21832      91    11216      260    .113    10.3     1267    29.4    86    2.1
8 30 PCT T      32    .030   10.50    1426    10.565    9390      31       54      421    .077     2.4        4    32.4    29   19.3
9 C.T.         710    .100    4.38      85     5.297    1692     247       66        9    .193    35.4        9     1.3     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     2.6       47     8.0
1 IDLE          44    .010    9.42      72     9.478    1692       8        4        4    .232     2.0        1     1.0     0   18.2
2 30 PCT T      46    .030   10.39    1294    10.470    9390      45       54      385    .077     3.4        4    29.7    29   19.3
3 60 PCT T      41    .030   10.96    1185    11.034   16965      68       93      605    .147    10.0       14    88.9    57    9.3
4 30 PCT T      37    .020   10.22    1391    10.280    9390      37       37      404    .077     2.8        3    31.1    29   19.3
5 10 PCT T      32    .010    9.37     469     9.415    6623      24       14      110    .057     1.4        1     6.2    10   17.9
6 30 PCT T      32    .020   10.28    1446    10.335    9390      31       37      436    .077     2.4        3    33.6    29   19.3
7 90 PCT T      56   4.160   12.07     584    16.290   21832      81    11262      260    .113     9.2     1273    29.4    86    2.1
8 30 PCT T      27    .030   10.39    1500    10.449    9390      26       54      448    .077     2.0        4    34.5    29   19.3
9 C.T.         690    .090    4.43      80     5.265    1692     235       58        9    .193    34.2        8     1.2     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     2.5       48     9.3
1 IDLE          32    .020   10.28      85    10.335    1692       6        7        5    .232     1.3        2     1.1     0   18.2
2 30 PCT T      46    .020   10.17    1299    10.240    9390      44       37      395    .077     3.5        3    30.5    29   19.3
3 60 PCT T      30    .040   11.94     830    12.012   16965      46      119      389    .147     6.7       17    57.2    57    9.3
4 30 PCT T      23    .010   10.39    1504    10.425    9390      22       18      450    .077     1.7        1    34.6    29   19.3
5 10 PCT T      23    .010    9.42     511     9.455    6623      17       14      119    .057     1.0        1     6.8    10   17.9
6 30 PCT T      35    .010   10.28    1369    10.328    9390      34       18      413    .077     2.6        1    31.8    29   19.3
7 90 PCT T      37   1.940   13.41    1239    15.390   21832      57     5559      584    .113     6.4      628    65.9    86    2.1
8 30 PCT T      45    .030   10.62    1544    10.699    9390      43       53      450    .077     3.3        4    34.6    29   19.3
9 C.T.         418    .100    4.65      90     5.201    1692     147       66       10    .193    21.0        4     1.9     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.7       24     9.6
1 IDLE          32    .020   10.28      85    10.335    1692       6        7        5    .232     1.3        2     1.1     0   18.2
2 30 PCT T      46    .020   10.34    1426    10.410    9390      45       36      427    .077     3.5        3    32.9    29   19.3
3 60 PCT T      27    .040   11.94     895    12.009   16965      41      119      420    .147     6.1       17    61.7    57    9.3
4 30 PCT T      32    .010   10.39    1509    10.435    9390      31       18      449    .077     2.4        1    34.6    29   19.3
5 10 PCT T      27    .010    9.52     584     9.559    6623      20       14      134    .057     1.2        1     7.7    10   17.9
6 30 PCT T      23    .010   10.28    1446    10.315    9390      23       18      437    .077     1.7        1    33.7    29   19.3
7 90 PCT T      30   2.250   13.27    1150    15.552   21832      45     6380      536    .113     5.1      721    60.6    86    2.1
8 30 PCT T      11    .020   10.50    1707    10.532    9390      11       36      505    .077      .8        3    38.9    29   19.3
9 C.T.         519    .090    4.58      97     5.231    1692     181       59       10    .193    25.9        8     1.8     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.7       28     9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     2.5       48     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     1.7       26     9.8
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     2.5) + 0.65(     1.7) =    2.021   GM/BHP HR
                                         CO- NDIR 0.35(    47.5) + 0.65(    25.9) =   33.495   GM/BHP HR
                                         NO2-NDIR 0.35(     8.6) + 0.65(     9.8) =    9.384   GM/BHP HR
                                                             CORRECTED NO2 =    9.490   GM/BHP HR
                                                                      BSFC =     .713   LB/BHP HR
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                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR           MAN.
MODE          HC-FID    CO     CO2   NO-CL     CARBON   CONS.     HC       CO      NO2    FACT.  HC-FID      CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE         304    .010    9.42      25     9.460    1692       5        4        1    .232     1.3        1      .3     0   18.2
2 30 PCT T     388    .010   10.06    1100    10.109    9390      36       19      339    .077     2.8        1    26.1    29   19.3
3 60 PCT T     462    .020   10.85     795    10.916   16965      72       63      410    .147    10.6        9    60.3    57    9.3
4 30 PCT T     328    .010   10.17    1275    10.213    9390      30       19      389    .077     2.3        1    30.0    29   19.3
5 10 PCT T     179    .010    9.21     412     9.238    6623      13       14       98    .057      .7        1     5.6    10   17.9
6 30 PCT T     328    .010   10.17    1262    10.213    9390      30       19      385    .077     2.3        1    29.7    29   19.3
7 90 PCT T    1282   4.190   12.07     512    16.338   21832     171    11175      227    .113    19.4     1263    25.7    86    2.1
8 30 PCT T     203    .030   10.50    1456    10.550    9390      18       54      430    .077     1.4        4    33.1    29   19.3
9 C.T.        8071    .100    4.38      39     5.287    1692     258       65        4    .193    36.4        4      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     2.8       47     7.7
1 IDLE         304    .010    9.42      25     9.460    1692       5        4        1    .232     1.3        1      .3     0   18.2
2 30 PCT T     439    .030   10.39    1325    10.464    9390      39       54      395    .077     3.0        4    30.4    29   19.3
3 60 PCT T     523    .030   10.96    1150    11.092   16965      80       93      587    .147    11.8       14    86.2    57    9.3
4 30 PCT T     380    .020   10.22    1362    10.278    9390      32       37      413    .077     2.5        3    31.8    29   19.3
5 10 PCT T     196    .010    9.37     462     9.400    6623      14       14      108    .057      .8        1     6.2    10   17.9
6 30 PCT T     361    .020   10.28    1429    10.336    9390      33       37      431    .077     2.5        3    33.2    29   19.3
7 90 PCT T    1269   4.160   12.07     506    16.357   21832     169    11216      224    .113    19.1     1267    25.3    86    2.1
8 30 PCT T     178    .030   10.39    1500    10.438    9390      16       55      448    .077     1.2        4    34.5    29   19.3
9 C.T.        8126    .090    4.43      42     5.333    1692     258       58        4    .193    36.9        8      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     2.9       48     9.1
1 IDLE         197    .020   10.28      37    10.320    1692       3        7        2    .232      .7        2      .5     0   18.2
2 30 PCT T     427    .020   10.17    1318    10.233    9390      39       37      402    .077     3.0        3    30.9    29   19.3
3 60 PCT T     144    .040   11.94     800    11.999   16965      20      119      376    .147     3.0       17    55.2    57    9.3
4 30 PCT T     241    .010   10.39    1531    10.424    9390      22       18      458    .077     1.7        1    35.3    29   19.3
5 10 PCT T     158    .010    9.42     466     9.448    6623      11       14      106    .057      .6        1     6.1    10   17.9
6 30 PCT T     307    .010   10.28    1412    10.321    9390      28       18      427    .077     2.1        1    32.8    29   19.3
7 90 PCT T     537   1.940   13.41    1187    15.404   21832      76     5554      559    .113     8.6      628    63.1    86    2.1
8 30 PCT T     220    .030   10.62    1637    10.678    9390      19       53      478    .077     1.5        4    36.8    29   19.3
9 C.T.        5637    .100    4.65      50     5.314    1692     180       64        5    .193    25.7        4      .8     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.7       24     9.5
1 IDLE         197    .020   10.28      37    10.320    1692       3        7        2    .232      .7        2      .5     0   18.2
2 30 PCT T     433    .020   10.34    1450    10.403    9390      39       36      435    .077     3.0        3    33.5    29   19.3
3 60 PCT T     133    .040   11.94     870    11.993   16965      19      119      409    .147     2.8       17    60.1    57    9.3
4 30 PCT T     208    .010   10.39    1525    10.421    9390      19       18      456    .077     1.4        1    35.1    29   19.3
5 10 PCT T     141    .010    9.52     562     9.544    6623      10       14      129    .057      .6        1     7.4    10   17.9
6 30 PCT T     279    .010   10.28    1506    10.318    9390      25       18      455    .077     2.0        1    35.0    29   19.3
7 90 PCT T     596   2.250   13.27    1087    15.579   21832      83     6369      506    .113     9.4      720    57.1    86    2.1
8 30 PCT T     110    .020   10.50    1708    10.531    9390      10       36      529    .077      .8        3    40.8    29   19.3
9 C.T.        6259    .090    4.58      57     5.296    1692     200       58        6    .193    28.6        8      .9     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.8       28     9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     2.9       47     8.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     1.8       26     9.7
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     2.9) + 0.65(     1.8) =    2.190   GM/BHP HR
                                         CO- NDIR 0.35(    47.3) + 0.65(    25.9) =   33.407   GM/BHP HR
                                         NO2-CL   0.35(     8.4) + 0.65(     9.7) =    9.236   GM/BHP HR
                                                             CORRECTED NO2 =    9.340   GM/BHP HR
                                                                      BSFC =     .713   LB/BHP HR
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                          TABLE B-18 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-1   TEST-8   RUN-2   EGR-AIR-CAT.          04-17-73     K = .939     HUM = 58.0  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR          MAN.
MODE            HC     CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.    HC       CO     NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE          37   .010    9.73     36    9.780    1692       7       3       2    .232     1.6       1      .5     0   18.2
2 30 PCT T      37   .010   10.28   1132   10.330    9390      36      18     342    .077     2.8       1    26.3    29   14.3
3 60 PCT T      27   .060   12.20    689   12.289   16965      40     167     316    .147     5.9      25    46.4    57    9.3
4 30 PCT T      27   .010   10.50   1299   10.539    9390      26      18     383    .077     2.0       1    29.5    29   14.3
5 10 PCT T      18   .010    9.32    385    9.349    6623      14      14      91    .057      .8       1     5.2    10   17.9
6 30 PCT T      37   .030   10.50   1465   10.570    9390      35      54     432    .077     2.7       4    33.3    29   14.3
7 90 PCT T      23  1.640   13.69   1097   15.355   21832      35    4710     518    .113     4.0     532    58.5    86    2.1
8 30 PCT T      18   .180   10.62   1446   10.819    9390      17     316     417    .077     1.3      24    32.1    29   14.3
9 C.T.         611   .130    4.39     24    5.130    1692     218      87       3    .143    31.1      12      .4     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.9      22     8.5
1 IDLE          37   .010    9.73     36    9.780    1692       7       3       2    .232     1.6       1      .5     0   18.2
2 30 PCT T      51   .030   10.62   1239   10.705    9390      48      53     361    .077     3.7       4    27.8    29   14.3
3 60 PCT T      18   .050   12.32    751   12.389   16965      27     138     341    .147     3.9      20    50.2    57    9.3
4 30 PCT T      32   .020   10.73   1485   10.785    9390      30      35     429    .077     2.3       3    33.1    29   14.3
5 10 PCT T      27   .010    9.63    469    9.669    6623      20      14     107    .057     1.1       1     6.1    10   17.9
6 30 PCT T      37   .020   10.62   1446   10.680    9390      35      36     422    .077     2.7       3    32.5    29   14.3
7 90 PCT T      23  1.070   13.98   1407   15.075   21832      36    3130     677    .113     4.1     354    76.4    86    2.1
8 30 PCT T      27   .030   10.85   1665   10.909    9390      25      52     476    .077     1.9       4    36.6    29   14.3
9 C.T.         470   .100    4.67     36    5.278    1692     163      65       4    .143    23.3       9      .5     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.6      15     9.6
1 IDLE          32   .020   10.06     36   10.115    1692       6       7       2    .232     1.3       2      .5     0   18.2
2 30 PCT T      46   .020   10.62   1388   10.690    9390      44      35     405    .077     3.4       3    31.2    29   14.3
3 60 PCT T      23   .050   12.32    782   12.395   16965      34     138     355    .147     5.0      20    52.2    57    9.3
4 30 PCT T      32   .010   10.73   1604   10.775    9390      30      18     464    .077     2.3       1    35.7    29   14.3
5 10 PCT T      23   .010    9.63    454    9.665    6623      17      14     103    .057     1.0       1     5.9    10   17.9
6 30 PCT T      37   .020   10.62   1544   10.680    9390      35      36     451    .077     2.7       3    34.7    29   14.3
7 90 PCT T      32   .690   13.98   1544   14.705   21832      51    2069     761    .113     5.8     234    86.0    86    2.1
8 30 PCT T      23   .020   10.62   1564   10.665    9390      22      36     457    .077     1.7       3    35.2    29   14.3
9 C.T.         672   .120    4.41     24    5.256    1692     234      78       3    .143    33.4      11      .4     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     2.1      10    10.3
1 IDLE          32   .020   10.06     36   10.115    1692       6       7       2    .232     1.3       2      .5     0   18.2
2 30 PCT T      46   .030   10.62   1446   10.700    9390      44      53     421    .077     3.4       4    32.4    29   14.3
3 60 PCT T      32   .050   12.20    782   12.285   16965      48     139     359    .147     7.0      21    52.7    57    9.3
4 30 PCT T      37   .010   10.62   1604   10.670    9390      35      18     469    .077     2.7       1    36.1    29   14.3
5 10 PCT T      18   .010    9.52    440    9.549    6623      13      14     101    .057      .8       1     5.8    10   17.9
6 30 PCT T      32   .020   10.50   1524   10.555    9390      31      36     450    .077     2.4       3    34.7    29   14.3
7 90 PCT T      27   .190   13.27   1564   13.489   21832      47     621     840    .113     5.3      70    95.0    86    2.1
8 30 PCT T      27   .020   10.62   1707   10.669    9390      26      36     499    .077     2.0       3    38.4    29   14.3
9 C.T.         801   .120    4.38     12    5.365    1692     273      76       1    .143    39.0      11      .2     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     2.3       4    10.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     1.8      18     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     2.2       7    10.5
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     1.8) + 0.65(     2.2) =    2.046   GM/BHP HR
                                         CO- NDIR 0.35(    18.2) + 0.65(     7.1) =   11.031   GM/BHP HR
                                         NO2-NDIR 0.35(     9.0) + 0.65(    10.5) =   10.006   GM/BHP HR
                                                            CORRECTED NO2 =    9.391   GM/BHP HR
                                                                     BSFC =     .713   LB/BHP HR
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.        WEIGHTED GM/HR           MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE         251   .010    9.73     25    9.765    1692       4       4       1    .232     1.0       1      .3     0   18.2
2 30 PCT T     318   .010   10.28   1212   10.322    9390      29      18     366    .077     2.2       1    28.2    29   14.3
3 60 PCT T     134   .060   12.20    687   12.273   16965      18     168     315    .147     2.7      25    46.3    57    9.3
4 30 PCT T     208   .010   10.50   1350   10.531    9390      19      18     400    .077     1.4       1    30.8    29   14.3
5 10 PCT T     130   .010    9.32    400    9.343    6623       9      14      94    .057      .5       1     5.4    10   17.9
6 30 PCT T     252   .030   10.50   1325   10.555    9390      22      54     391    .077     1.7       4    30.1    29   14.3
7 90 PCT T     434  1.640   13.69   1050   15.373   21832      62    4705     495    .113     7.0     532    55.9    86    2.1
8 30 PCT T     193   .180   10.62   1475   10.819    9390      12     316     425    .077     1.0      24    32.7    29   14.3
9 C.T.        5207   .130    4.34     19    4.991    1692     177      89       2    .143    25.2      13      .3     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.6      22     8.4
1 IDLE         251   .010    9.73     25    9.765    1692       4       4       1    .232     1.0       1      .3     0   18.2
2 30 PCT T     363   .030   10.62   1262   10.686    9390      32      53     368    .077     2.5       4    28.3    29   14.3
3 60 PCT T     111   .050   12.32    762   12.381   16965      15     138     347    .147     2.2      20    51.0    57    9.3
4 30 PCT T     187   .020   10.73   1512   10.769    9390      16      35     438    .077     1.3       3    33.7    29   14.3
5 10 PCT T     120   .010    9.63    475    9.652    6623       8      14     108    .057      .5       1     6.2    10   17.9
6 30 PCT T     242   .020   10.62   1550   10.664    9390      21      36     453    .077     1.6       3    34.9    29   14.3
7 90 PCT T     205  1.070   13.98   1325   15.071   21832      30    3131     637    .113     3.4     354    72.0    86    2.1
8 30 PCT T      88   .030   10.85   1725   10.889    9390       8      52     494    .077      .6       4    38.0    29   14.3
9 C.T.        4803   .100    4.67     16    5.250    1692     155      65       2    .143    22.1       9      .2     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.3      15     9.7
1 IDLE         219   .020   10.06     37   10.102    1692       4       7       2    .232      .8       2      .5     0   18.2
2 30 PCT T     428   .020   10.62   1450   10.683    9390      38      36     423    .077     2.9       3    32.6    29   14.3
3 60 PCT T     123   .050   12.32    775   12.382   16965      17     138     353    .147     2.5      20    51.8    57    9.3
4 30 PCT T     209   .010   10.73   1650   10.761    9390      18      18     478    .077     1.4       1    36.8    29   14.3
5 10 PCT T     142   .010    9.63    450    9.654    6623      10      14     102    .057      .6       1     5.8    10   17.9
6 30 PCT T     286   .020   10.62   1600   10.669    9390      25      36     468    .077     1.9       3    36.0    29   14.3
7 90 PCT T     182   .690   13.98   1535   14.688   21832      27    2072     757    .113     3.1     234    85.6    86    2.1
8 30 PCT T     110   .020   10.62   1625   10.651    9390      10      36     476    .077      .7       3    36.6    29   14.3
9 C.T.        5835   .120    4.41     16    5.113    1692     193      80       2    .143    27.6      11      .3     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.5      10    10.4
1 IDLE         219   .020   10.06     37   10.102    1692       4       7       2    .232      .8       2      .5     0   18.2
2 30 PCT T     395   .030   10.62   1550   10.690    9390      35      53     452    .077     2.7       4    34.8    29   14.3
3 60 PCT T     111   .050   12.20    775   12.261   16965      15     140     356    .147     2.3      21    52.3    57    9.3
4 30 PCT T     198   .010   10.62   1650   10.650    9390      17      18     483    .077     1.3       1    37.2    29   14.3
5 10 PCT T     131   .010    9.52    462    9.543    6623       9      14     106    .057      .5       1     6.1    10   17.9
6 30 PCT T     252   .020   10.50   1600   10.545    9390      22      36     473    .077     1.7       3    36.4    29   14.3
7 90 PCT T      79   .190   13.27   1650   13.468   21832      13     622     888    .113     1.4      70   100.3    86    2.1
8 30 PCT T     193   .020   10.62   1737   10.659    9390      13      36     508    .077     1.0       3    39.1    29   14.3
9 C.T.        6091   .120    4.38     19    5.109    1692     200      80       2    .143    28.6      11      .2     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.5       4    11.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     1.4      18     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     1.5       7    10.8
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     1.4) + 0.65(     1.5) =    1.468   GM/BHP HR
                                         CO- NDIR 0.35(    18.2) + 0.65(     7.2) =   11.047   GM/BHP HR
                                         NO2-CL   0.35(     9.0) + 0.65(    10.8) =   10.184   GM/BHP HR
                                                            CORRECTED NO2 =    9.558   GM/BHP HR
                                                                     BSFC =     .713   LB/BHP HR
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                    TABLE B-19 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-1   TEST-6   RUN-3   EGR-AIR-CAT.          04-17-73      K =1.018      HUM = 80.9  GR/LB
----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE            HC      CO     CO2     NO   CARBON   CONS.      HC      CO    NO2   FACT.    HC      CO    NO2    HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE          46    .010    9.21     48    9.270    1692       9       4      3   .232    2.1      1     .7     0   18.2
2 30 PCT T      46    .010   10.28   1020   10.390    9390      45      18    308   .077    3.5      1   23.7    29   14.3
3 60 PCT T      11    .060   12.32    720   12.392   16965      16     166    327   .147    2.4     24   48.1    57    4.3
4 30 PCT T      23    .020   10.73   1331   10.775    9390      22      35    385   .077    1.7      3   29.7    29   14.3
5 10 PCT T      20    .010    9.52    426    9.552    6623      15      14     98   .057     .9      1    5.6    10   17.9
6 30 PCT T      32    .020   10.62   1276   10.675    9390      30      36    373   .077    2.3      3   28.7    29   14.3
7 90 PCT T      23    .410   14.13   1624   14.565   21832      37    1241    808   .113    4.2    140   91.3    86    2.1
8 30 PCT T      27    .020   10.73   1465   10.779    9390      25      35    424   .077    2.0      3   32.6    29   14.3
9 C.T.         710    .100    4.20     50    5.067    1692     256      67      6   .143   36.6     10     .8     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.0      7    9.5
1 IDLE          46    .020    9.21     48    9.280    1692       9       7      3   .232    2.1      2     .7     0   18.2
2 30 PCT T      41    .030   10.62   1248   10.694    9390      39      53    364   .077    3.0      4   28.0    29   14.3
3 60 PCT T      32    .050   12.32    798   12.405   16965      47     138    362   .147    6.9     20   53.3    57    4.3
4 30 PCT T      37    .020   10.73   1485   10.790    9390      35      35    429   .077    2.7      3   33.0    29   14.3
5 10 PCT T      32    .010    9.63    464    9.675    6623      24      14    107   .057    1.3      1    6.1    10   17.4
6 30 PCT T      39    .020   10.56   1365   10.622    9390      37      36    401   .077    2.9      3   30.8    29   14.3
7 90 PCT T      35    .620   14.13   1564   14.788   21832      56    1849    767   .113    6.3    209   86.6    86    2.1
8 30 PCT T      35    .020   10.62   1604   10.678    9390      33      36    468   .077    2.6      3   36.1    29   14.3
9 C.T.         650    .090    4.36     52    5.152    1692     231      60      6   .143   33.0      9     .8     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.2      9   10.0
1 IDLE          39    .010    9.79     36    9.842    1692       7       3      2   .232    1.7      1     .5     0   18.2
2 30 PCT T      48    .020   10.50   1331   10.572    9390      46      36    392   .077    3.5      3   30.2    29   14.3
3 60 PCT T      32    .050   12.20    782   12.285   16965      48     139    359   .147    7.0     21   52.7    57    4.3
4 30 PCT T      39    .020   10.62   1564   10.682    9390      37      36    456   .077    2.9      3   35.1    29   14.3
5 10 PCT T      32    .010    9.52    454    9.565    6623      24      14    104   .057    1.4      1    5.9    10   17.9
6 30 PCT T      41    .020   10.50   1524   10.564    9390      39      36    450   .077    3.0      3   34.6    29   14.3
7 90 PCT T      29    .550   13.69   1524   14.271   21832      48    1700    774   .113    5.4    192   87.5    86    2.1
8 30 PCT T      35    .020   10.34   1485   10.398    9390      34      36    445   .077    2.6      3   34.3    29   14.3
9 C.T.         634    .080    4.34     45    5.105    1692     227      54      5   .143   32.5      8     .7     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.2      8   10.3
1 IDLE          39    .010    9.79     36    9.842    1692       7       3      2   .232    1.7      1     .5     0   18.2
2 30 PCT T      51    .030   10.34   1331   10.425    9390      50      55    398   .077    3.8      4   30.6    29   14.3
3 60 PCT T      25    .050   11.94    767   12.017   16965      38     143    359   .147    5.6     21   52.8    57    4.3
4 30 PCT T      35    .010   10.28   1485   10.328    9390      34      18    448   .077    2.6      1   34.5    29   14.3
5 10 PCT T      32    .010    9.26    483    9.305    6623      25      14    114   .057    1.4      1    6.5    10   17.9
6 30 PCT T      39    .020   10.17   1426   10.232    9390      39      37    434   .077    3.0      3   33.5    29   14.3
7 90 PCT T      35    .940   13.41   1364   14.388   21832      57    2881    690   .113    6.5    326   77.9    86    2.1
8 30 PCT T      32    .030   10.17   1544   10.235    9390      32      56    470   .077    2.4      4   36.2    29   14.3
9 C.T.         645    .090    4.15     50    4.937    1692     239      62      6   .143   34.1      9     .8     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.2     13   10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   2.1      8    9.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------   2.2     11   10.1
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     2.1) + 0.65(     2.2) =    2.178   GM/BHP HR
                                         CO- NDIR 0.35(     8.0) + 0.65(    11.0) =    9.937   GM/BHP HR
                                         NO2-NDIR 0.35(     9.8) + 0.65(    10.1) =    9.999   GM/BHP HR
                                                           CORRECTED NO2 =   10.176   GM/BHP HR
                                                                    BSFC =     .713   LB/BHP HR
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              CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE          HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC      CO    NO2   FACT.  HC-FID    CO  NO2-CL  HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE         239    .010    9.21     25    9.244    1692       4       4      2   .232    1.0      1     .4     0   18.2
2 30 PCT T     318    .010   10.28   1075   10.322    9390      29      18    325   .077    2.2      1   25.0    29   14.3
3 60 PCT T     201    .060   12.32    700   12.400   16965      27     166    318   .147    4.0     24   46.7    57    4.3
4 30 PCT T     253    .020   10.73   1354   10.775    9390      22      35    392   .077    1.7      3   30.2    29   14.3
5 10 PCT T     163    .010    9.52    418    9.546    6623      11      14     96   .057     .6      1    5.5    10   17.9
6 30 PCT T     308    .020   10.62   1275   10.671    9390      27      36    372   .077    2.1      3   28.7    29   14.3
7 90 PCT T     153    .410   14.13   1600   14.555   21832      23    1242    797   .113    2.6    140   90.0    86    2.1
8 30 PCT T     176    .020   10.73   1500   10.768    9390      15      35    434   .077    1.2      3   33.4    29   14.3
9 C.T.        8234    .100    4.20     73    5.173    1692     286      66      8   .143   40.8      9    1.1     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.1      7    9.6
1 IDLE         239    .020    9.21     25    9.254    1692       4       7      2   .232    1.0      2     .4     0   18.2
2 30 PCT T     461    .030   10.62   1300   10.696    9390      41      53    379   .077    3.1      4   29.2    29   14.3
3 60 PCT T     162    .050   12.32    806   12.386   16965      22     138    367   .147    3.3     20   53.9    57    4.3
4 30 PCT T     242    .020   10.73   1542   10.774    9390      21      35    446   .077    1.6      3   34.4    29   14.3
5 10 PCT T     152    .010    9.63    462    9.655    6623      10      14    105   .057     .6      1    6.0    10   17.9
6 30 PCT T     302    .020   10.56   1450   10.610    9390      27      36    426   .077    2.1      3   32.8    29   14.3
7 90 PCT T     188    .620   14.13   1562   14.769   21832      28    1851    767   .113    3.1    209   86.6    86    2.1
8 30 PCT T     159    .020   10.62   1658   10.656    9390      14      36    485   .077    1.1      3   37.3    29   14.3
9 C.T.        8329    .090    4.36     82    5.283    1692     267      58      9   .143   38.1      8    1.2     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   2.0      9   10.3
1 IDLE         175    .010    9.79     31    9.817    1692       3       3      2   .232     .7      1     .4     0   18.2
2 30 PCT T     439    .020   10.50   1391   10.564    9390      39      36    410   .077    3.0      3   31.6    29   14.3
3 60 PCT T     195    .050   12.20    787   12.269   16965      27     140    361   .147    4.0     21   53.1    57    4.3
4 30 PCT T     242    .020   10.62   1600   10.664    9390      21      36    468   .077    1.6      3   36.0    29   14.3
5 10 PCT T     180    .010    9.52    450    9.548    6623      12      14    104   .057     .7      1    5.9    10   17.9
6 30 PCT T     198    .020   10.50   1587   10.540    9390      18      36    469   .077    1.4      3   36.1    29   14.3
7 90 PCT T     187    .550   13.69   1604   14.259   21832      29    1701    815   .113    3.2    192   92.1    86    2.1
8 30 PCT T     154    .020   10.34   1508   10.376    9390      14      37    453   .077    1.1      3   34.9    29   14.3
9 C.T.        6662    .080    4.34     75    5.086    1692     222      54      8   .143   31.7      8    1.2     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   1.7      8   10.6
1 IDLE         175    .010    9.79     31    9.817    1692       3       3      2   .232     .7      1     .4     0   18.2
2 30 PCT T     438    .030   10.34   1391   10.419    9390      40      55    416   .077    3.0      4   32.1    29   14.3
3 60 PCT T     161    .050   11.94    767   12.006   16965      23     143    360   .147    3.3     21   52.9    57    4.3
4 30 PCT T     230    .010   10.28   1525   10.313    9390      21      18    461   .077    1.6      1   35.5    29   14.3
5 10 PCT T     163    .010    9.26    483    9.286    6623      12      14    114   .057     .7      1    6.5    10   17.9
6 30 PCT T     175    .020   10.17   1462   10.208    9390      16      37    447   .077    1.2      3   34.4    29   14.3
7 90 PCT T     272    .940   13.41   1375   14.377   21832      41    2883    693   .113    4.7    326   78.3    86    2.1
8 30 PCT T     153    .030   10.17   1606   10.215    9390      14      56    490   .077    1.1      4   37.7    29   14.3
9 C.T.        6807    .090    4.15     80    4.921    1692     234      63      9   .143   33.5      9    1.3     0   23.8
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   1.8     13   10.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   2.0      8    9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------   1.8     11   10.4
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     2.0) + 0.65(     1.8) =    1.856   GM/BHP HR
                                         CO- NDIR 0.35(     8.0) + 0.65(    11.0) =    9.944   GM/BHP HR
                                         NO2-CL   0.35(     9.9) + 0.65(    10.4) =   10.224   GM/BHP HR
                                                           CORRECTED NO2 =   10.404   GM/BHP HR
                                                                    BSFC =     .713   LB/BHP HR
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TABLE B-20 MASS EMISSIONS BY NINE-MODE EPA

ENGINE 2-1 TEST-8 RUN-4 EGR-AIR-CAT. 04-19-73 K =1.072 HUM =103.2 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	51	.010	8.92	73	8.985	1692	10	4	5	.232	2.4	1	1.1	0	18.2
2 30 PCT T	51	.020	9.88	961	9.955	9390	52	38	301	.077	4.0	3	23.2	29	19.3
3 60 PCT T	37	.070	12.05	629	12.160	16965	56	197	291	.147	8.2	29	42.8	57	9.3
4 30 PCT T	42	.020	10.33	1063	10.395	9390	41	36	319	.077	3.2	3	24.5	29	19.3
5 10 PCT T	37	.010	9.33	358	9.380	6623	28	14	84	.057	1.6	1	4.8	10	17.9
6 30 PCT T	48	.020	10.33	1150	10.402	9390	47	36	345	.077	3.6	3	26.6	29	19.3
7 90 PCT T	47	1.330	13.58	1115	14.961	21832	74	3921	540	.113	8.4	443	61.0	86	2.1
8 30 PCT T	37	.020	10.56	1222	10.620	9390	35	36	359	.077	2.7	3	27.6	29	19.3
9 C.T.	672	.100	4.25	85	5.076	1692	242	67	9	.143	34.6	10	1.3	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											2.5	18	7.8		
1 IDLE	51	.100	8.92	73	9.075	1692	10	38	5	.232	2.4	9	1.0	0	18.2
2 30 PCT T	44	.030	10.21	1080	10.288	9390	43	55	327	.077	3.3	4	25.2	29	19.3
3 60 PCT T	35	.060	12.31	644	12.408	16965	52	166	292	.147	7.6	24	43.0	57	9.3
4 30 PCT T	37	.020	10.68	1276	10.740	9390	35	35	370	.077	2.7	3	28.5	29	19.3
5 10 PCT T	35	.010	9.66	413	9.708	6623	26	14	94	.057	1.5	1	5.3	10	17.9
6 30 PCT T	42	.010	10.56	1313	10.615	9390	40	18	386	.077	3.1	1	29.7	29	19.3
7 90 PCT T	33	.350	13.78	1370	14.166	21832	55	1090	701	.113	6.2	123	79.2	86	2.1
8 30 PCT T	33	.020	10.68	1280	10.736	9390	31	35	372	.077	2.4	3	28.6	29	19.3
9 C.T.	634	.080	4.32	48	5.085	1692	228	54	5	.143	32.6	8	.8	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											2.3	6	8.8		
1 IDLE	18	.020	9.99	36	10.029	1692	3	7	2	.232	.8	2	.5	0	18.2
2 30 PCT T	54	.020	10.56	1132	10.638	9390	51	36	332	.077	4.0	3	25.6	29	19.3
3 60 PCT T	37	.060	12.45	585	12.550	16965	54	164	263	.147	7.9	24	38.6	57	9.3
4 30 PCT T	39	.010	10.68	1276	10.732	9390	37	18	371	.077	2.8	1	28.5	29	19.3
5 10 PCT T	33	.010	9.55	371	9.596	6623	25	14	85	.057	1.4	1	4.8	10	17.9
6 30 PCT T	42	.020	10.68	1332	10.745	9390	40	35	386	.077	3.1	3	29.8	29	19.3
7 90 PCT T	33	.340	13.73	1408	14.106	21832	55	1063	724	.113	6.2	120	81.8	86	2.1
8 30 PCT T	30	.020	10.68	1332	10.732	9390	28	35	387	.077	2.2	3	29.8	29	19.3
9 C.T.	744	.080	4.32	60	5.204	1692	263	52	6	.143	37.6	8	.9	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											2.4	6	8.8		
1 IDLE	18	.020	9.99	36	10.029	1692	3	7	2	.232	.8	2	.5	0	18.2
2 30 PCT T	54	.020	10.44	1045	10.518	9390	52	36	310	.077	4.0	3	23.8	29	19.3
3 60 PCT T	33	.050	12.31	599	12.396	16965	49	138	272	.147	7.2	20	40.0	57	9.3
4 30 PCT T	42	.010	10.56	1276	10.615	9390	40	18	375	.077	3.1	1	28.9	29	19.3
5 10 PCT T	35	.010	9.44	317	9.488	6623	26	14	73	.057	1.5	1	4.2	10	17.9
6 30 PCT T	42	.020	10.44	1222	10.505	9390	41	36	363	.077	3.1	3	27.9	29	19.3
7 90 PCT T	37	.370	13.73	1276	14.140	21832	62	1154	654	.113	7.0	130	73.9	86	2.1
8 30 PCT T	35	.020	10.56	1350	10.618	9390	33	36	396	.077	2.6	3	30.5	29	19.3
9 C.T.	744	.040	3.99	46	4.834	1692	283	28	5	.143	40.4	4	.8	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											2.5	6	8.4		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											2.4	12	8.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											2.5	6	8.6		

FOUR CYCLE COMPOSITE -

HC- NDIR 0.35(2.4) + 0.65(2.5) = 2.439 GM/BHP HR
CO- NDIR 0.35(12.2) + 0.65(6.0) = 8.193 GM/BHP HR
NO2-NDIR 0.35(8.3) + 0.65(8.6) = 8.476 GM/BHP HR
CORRECTED NO2 = 9.090 GM/BHP HR
BSFC = .713 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	271	.010	8.92	30	8.957	1692	5	4	2	.232	1.2	1	.4	0	18.2
2 30 PCT T	349	.020	9.88	875	9.935	9390	33	38	275	.077	2.5	3	21.1	29	19.3
3 60 PCT T	239	.070	12.05	562	12.144	16965	33	198	261	.147	4.9	29	38.3	57	9.3
4 30 PCT T	263	.020	10.33	1050	10.376	9390	24	37	315	.077	1.8	3	24.3	29	19.3
5 10 PCT T	196	.010	9.33	312	9.360	6623	14	14	73	.057	.8	1	4.2	10	17.9
6 30 PCT T	318	.020	10.33	1087	10.382	9390	29	37	326	.077	2.2	3	25.1	29	19.3
7 90 PCT T	421	1.330	13.58	1050	14.952	21832	61	3923	509	.113	6.9	443	57.5	86	2.1
8 30 PCT T	176	.020	10.56	1225	10.598	9390	16	36	360	.077	1.2	3	27.7	29	19.3
9 C.T.	5201	.100	4.25	37	4.870	1692	181	70	4	.143	25.8	10	.6	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											1.7	18	7.3		
1 IDLE	271	.100	8.92	30	9.047	1692	5	38	2	.232	1.2	9	.4	0	18.2
2 30 PCT T	408	.030	10.21	1062	10.281	9390	37	55	322	.077	2.8	4	24.8	29	19.3
3 60 PCT T	178	.060	12.31	600	12.388	16965	24	166	273	.147	3.6	24	40.1	57	9.3
4 30 PCT T	220	.020	10.68	1237	10.722	9390	19	35	360	.077	1.5	3	27.7	29	19.3
5 10 PCT T	174	.010	9.66	387	9.687	6623	12	14	88	.057	.7	1	5.0	10	17.9
6 30 PCT T	274	.010	10.56	1237	10.597	9390	24	18	364	.077	1.9	1	28.0	29	19.3
7 90 PCT T	153	.350	13.78	1375	14.145	21832	24	1091	705	.113	2.7	123	79.6	86	2.1
8 30 PCT T	165	.020	10.68	1350	10.716	9390	14	35	393	.077	1.1	3	30.2	29	19.3
9 C.T.	4995	.080	4.32	50	4.900	1692	173	56	6	.143	24.7	8	.8	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											1.5	6	8.6		
1 IDLE	284	.020	9.99	38	10.038	1692	5	7	2	.232	1.1	2	.5	0	18.2
2 30 PCT T	395	.020	10.56	1200	10.620	9390	35	36	352	.077	2.7	3	27.1	29	19.3
3 60 PCT T	156	.060	12.45	600	12.526	16965	21	164	270	.147	3.1	24	39.7	57	9.3
4 30 PCT T	214	.010	10.68	1313	10.711	9390	19	18	382	.077	1.4	1	29.4	29	19.3
5 10 PCT T	163	.010	9.55	387	9.576	6623	11	14	89	.057	.6	1	5.1	10	17.9
6 30 PCT T	264	.020	10.68	1400	10.726	9390	23	35	407	.077	1.8	3	31.3	29	19.3
7 90 PCT T	136	.340	13.73	1412	14.084	21832	21	1065	727	.113	2.4	120	82.1	86	2.1
8 30 PCT T	154	.020	10.68	1375	10.715	9390	13	35	400	.077	1.0	3	30.8	29	19.3
9 C.T.	5620	.080	4.32	62	4.962	1692	192	55	7	.143	27.4	8	1.0	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											1.5	6	9.0		
1 IDLE	284	.020	9.99	38	10.038	1692	5	7	2	.232	1.1	2	.6	0	18.2
2 30 PCT T	373	.020	10.44	1112	10.497	9390	33	36	330	.077	2.6	3	25.4	29	19.3
3 60 PCT T	195	.050	12.31	620	12.379	16965	20	138	282	.147	2.9	20	41.5	57	9.3
4 30 PCT T	198	.010	10.56	1350	10.590	9390	18	18	397	.077	1.3	1	30.6	29	19.3
5 10 PCT T	152	.010	9.44	337	9.465	6623	11	14	78	.057	.6	1	4.5	10	17.9
6 30 PCT T	241	.020	10.44	1287	10.484	9390	22	36	383	.077	1.7	3	29.5	29	19.3
7 90 PCT T	153	.370	13.73	1287	14.115	21832	24	1156	661	.113	2.7	131	74.7	86	2.1
8 30 PCT T	165	.020	10.56	1400	10.596	9390	15	36	412	.077	1.1	3	31.7	29	19.3
9 C.T.	6224	.040	3.99	50	4.652	1692	226	29	6	.143	32.4	4	.9	0	23.0
CYCLE COMPOSITE IN GM/BHP HR											1.7	6	8.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											1.6	12	7.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											1.6	6	8.9		

FOUR CYCLE COMPOSITE -

HC- FID 0.35(1.6) + 0.65(1.6) = 1.601 GM/BHP HR
CO- NDIR 0.35(12.2) + 0.65(6.0) = 8.214 GM/BHP HR
NO2-CL 0.35(7.9) + 0.65(8.9) = 8.544 GM/BHP HR
CORRECTED NO2 = 9.162 GM/BHP HR
BSFC = .713 LB/BHP HR

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                          TABLE B-21 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-2   TEST-4   RUN-1   EGR-CAT.                 04-17-73      K = .969     HUM = 66.1  GR/LB
-----------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE             HC      CO    CO2      NO    CARBON   CONS.       HC      CO    NO2   FACT.    HC       CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE          102    .290  11.69      97   12.090    1679        15      81      4   .232    3.5       19    1.0     0   18.6
2 30 PCT T       56    .020  12.99    1584   13.070    9662        45      30    389   .077    3.4        2   29.9    29   14.3
3 60 PCT T       37    .160  13.55     878   13.750   17196        50     403    363   .147    7.3       59   53.4    57    9.8
4 30 PCT T       37    .010  13.13    1791   13.180    9662        29      15    436   .077    2.3        1   33.6    29   14.3
5 10 PCT T       27    .010  12.48     585   12.519    6350        15      10     99   .057     .8        1    5.6    10   18.0
6 30 PCT T       37    .010  12.86    1749   12.910    9662        30      15    435   .077    2.3        1   33.5    29   14.3
7 90 PCT T       51   1.410  13.55    1728   15.015   21250        78    4031    812   .113    8.8      455   91.7    86    2.2
8 30 PCT T       32    .020  13.13    2034   13.185    9662        25      30    495   .077    2.0        2   38.1    29   14.3
9 C.T.          826    .020   7.60      85    8.512    1683       176       8      6   .143   25.2        1     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.0       20   10.5
1 IDLE          102    .290  11.69      97   12.090    1679        15      81      4   .232    3.5       19    1.0     0   18.6
2 30 PCT T       65    .020  12.99    1813   13.080    9662        52      30    445   .077    4.0        2   34.2    29   14.3
3 60 PCT T       46    .170  14.28     878   14.500   17196        59     406    345   .147    8.6       60   50.7    57    9.8
4 30 PCT T       32    .010  13.69    1922   13.735    9662        24      14    449   .077    1.9        1   34.6    29   14.3
5 10 PCT T       32    .010  13.13     751   13.175    6350        17      10    120   .057     .9        1    6.8    10   18.0
6 30 PCT T       41    .010  13.69    1878   13.744    9662        31      14    438   .077    2.4        1   33.7    29   14.3
7 90 PCT T       74   2.370  14.13    1900   16.580   21250       102    6136    808   .113   11.6      693   91.4    86    2.2
8 30 PCT T       32    .030  14.13    1769   14.195    9662        24      41    400   .077    1.8        3   30.8    29   14.3
9 C.T.          710    .020   7.96      85    8.747    1683       148       8      5   .143   21.1        1     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.0       28   10.4
1 IDLE          135    .730  12.72     123   13.596    1679        18     182      5   .232    4.2       42    1.2     0   18.6
2 30 PCT T       60    .020  13.69    1856   13.775    9662        45      28    432   .077    3.5        2   33.3    29   14.3
3 60 PCT T       46    .190  12.72     911   12.960   17196        66     508    400   .147    9.7       75   58.8    57    9.8
4 30 PCT T       42    .010  13.27    2024   13.325    9662        33      15    487   .077    2.5        1   37.5    29   14.3
5 10 PCT T       32    .010  11.57     689   11.615    6350        19      11    125   .057    1.1        1    7.1    10   18.0
6 30 PCT T       41    .010  13.55    2057   13.604    9662        31      14    485   .077    2.4        1   37.3    29   14.3
7 90 PCT T       56   1.940  13.69    1749   15.690   21250        82    5307    786   .113    9.3      600   88.9    86    2.2
8 30 PCT T       32    .020  13.27    2080   13.325    9662        25      29    501   .077    1.9        2   38.6    29   14.3
9 C.T.          787    .010   7.51      85    8.370    1683       171       4      6   .143   24.4        1     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.2       26   11.1
1 IDLE          135    .730  12.72     123   13.596    1679        18     182      5   .232    4.2       42    1.2     0   18.6
2 30 PCT T       65    .020  13.69    1856   13.780    9662        49      28    432   .077    3.8        2   33.3    29   14.3
3 60 PCT T       46    .180  14.43     961   14.660   17196        58     425    373   .147    8.5       63   54.9    57    9.8
4 30 PCT T       37    .010  13.84    1967   13.890    9662        28      14    454   .077    2.1        1   35.0    29   14.3
5 10 PCT T       32    .010  13.27     705   13.315    6350        16      10    112   .057     .9        1    6.4    10   18.0
6 30 PCT T       41    .010  13.69    2012   13.744    9662        31      14    470   .077    2.4        1   36.2    29   14.3
7 90 PCT T       65   1.310  14.43    1749   15.810   21250        94    3557    780   .113   10.7      402   88.2    86    2.2
8 30 PCT T       37    .020  13.84    2246   13.900    9662        28      28    518   .077    2.1        2   39.9    29   14.3
9 C.T.          710    .020   7.96      85    8.747    1683       148       8      5   .143   21.1        1     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.0       19   10.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------        2.0       24   10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------        2.1       23   10.9
FOUR CYCLE COMPOSITE -
                                      HC- NDIR 0.35(     2.0) + 0.65(     2.1) =    2.073   GM/BHP HR
                                      CO- NDIR 0.35(    24.1) + 0.65(    22.6) =   23.126   GM/BHP HR
                                      NO2-NDIR 0.35(    10.4) + 0.65(    10.9) =   10.747   GM/BHP HR
                                                             CORRECTED NO2 =   10.417   GM/BHP HR
                                                                      BSFC =     .714   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE            HC-FID   CO    CO2   NO-CL    CARBON   CONS.       HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL  HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE         1511    .290  11.69      25   12.131    1679        21      81      1   .232    4.8       19     .3     0   18.6
2 30 PCT T      527    .020  12.99    1487   13.063    9662        39      30    365   .077    3.0        2   28.1    29   14.3
3 60 PCT T      383    .160  13.55     775   13.748   17196        48     403    321   .147    7.0       59   47.2    57    9.8
4 30 PCT T      247    .010  13.13    1687   13.165    9662        18      15    411   .077    1.4        1   31.7    29   14.3
5 10 PCT T       89    .010  12.48     500   12.499    6350         5      10     84   .057     .3        1    4.8    10   18.0
6 30 PCT T      291    .010  12.86    1750   12.899    9662        22      15    435   .077    1.7        1   33.5    29   14.3
7 90 PCT T     1070   1.410  13.55    1700   15.067   21250       151    4017    796   .113   17.1      454   89.9    86    2.2
8 30 PCT T      263    .020  13.13    2025   13.176    9662        19      30    493   .077    1.5        2   38.0    29   14.3
9 C.T.         6744    .020   7.60      15    8.294    1683       137       8      1   .143   19.6        1     .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.1       20   10.0
1 IDLE         1511    .290  11.69      25   12.131    1679        21      81      1   .232    4.8       19     .3     0   18.6
2 30 PCT T      583    .020  12.99    1775   13.068    9662        43      30    436   .077    3.3        2   33.5    29   14.3
3 60 PCT T      351    .170  14.28     837   14.485   17196        42     406    329   .147    6.1       60   48.4    57    9.8
4 30 PCT T      214    .010  13.69    1925   13.721    9662        15      14    450   .077    1.2        1   34.7    29   14.3
5 10 PCT T      101    .010  13.13     675   13.150    6350         5      10    108   .057     .3        1    6.2    10   18.0
6 30 PCT T      293    .010  13.69    1925   13.729    9662        21      14    450   .077    1.6        1   34.6    29   14.3
7 90 PCT T     1475   2.370  14.13    1875   16.648   21250       188    6111    795   .113   21.3      691   89.8    86    2.2
8 30 PCT T      328    .030  14.13    1800   14.193    9662        22      41    407   .077    1.7        3   31.3    29   14.3
9 C.T.         6837    .020   7.96      16    8.664    1683       133       8      1   .143   19.0        1     .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.2       28   10.2
1 IDLE         1912    .730  12.72      37   13.641    1679        23     181      2   .232    5.4       42     .3     0   18.6
2 30 PCT T      530    .020  13.69    1887   13.763    9662        37      28    440   .077    2.9        2   33.9    29   14.3
3 60 PCT T      358    .190  12.72     862   12.946   17196        47     508    379   .147    7.0       75   55.7    57    9.8
4 30 PCT T      225    .010  13.27    2100   13.302    9662        16      15    506   .077    1.3        1   39.0    29   14.3
5 10 PCT T       89    .010  11.57     638   11.589    6350         5      11    116   .057     .3        1    6.6    10   18.0
6 30 PCT T      281    .010  13.55    2137   13.588    9662        20      14    504   .077    1.5        1   38.8    29   14.3
7 90 PCT T     1133   1.940  13.69    1750   15.743   21250       153    5290    784   .113   17.3      598   88.6    86    2.2
8 30 PCT T      213    .020  13.27    2106   13.311    9662        15      29    508   .077    1.2        2   39.1    29   14.3
9 C.T.         6845    .010   7.51      15    8.205    1683       140       4      1   .143   20.1        1     .1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        2.1       26   11.0
1 IDLE         1912    .730  12.72      37   13.641    1679        23     181      2   .232    5.4       42     .3     0   18.6
2 30 PCT T      507    .020  13.69    1875   13.761    9662        36      28    437   .077    2.7        2   33.7    29   14.3
3 60 PCT T      375    .180  14.43     900   14.647   17196        44     426    350   .147    6.4       63   51.4    57    9.8
4 30 PCT T      226    .010  13.84    2000   13.873    9662        16      14    462   .077    1.2        1   35.6    29   14.3
5 10 PCT T       90    .010  13.27     637   13.289    6350         4      10    101   .057     .2        1    5.8    10   18.0
6 30 PCT T      282    .010  13.69    2012   13.728    9662        20      14    470   .077    1.5        1   36.2    29   14.3
7 90 PCT T      859   1.310  14.43    1700   15.826   21250       115    3553    758   .113   13.0      402   85.6    86    2.2
8 30 PCT T      226    .020  13.84    2350   13.883    9662        16      28    543   .077    1.2        2   41.8    29   14.3
9 C.T.         6013    .020   7.96      37    8.581    1683       118       8      2   .143   16.9        1     .3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------        1.8       19   10.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------        2.1       24   10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------        1.9       23   10.8
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(     2.1) + 0.65(     1.9) =    1.989   GM/BHP HR
                                      CO- NDIR 0.35(    24.0) + 0.65(    22.5) =   23.068   GM/BHP HR
                                      NO2-CL   0.35(    10.1) + 0.65(    10.8) =   10.552   GM/BHP HR
                                                             CORRECTED NO2 =   10.227   GM/BHP HR
                                                                      BSFC =     .714   LB/BHP HR
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                         TABLE B-22 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-2    TEST=9   RUN=2   EGR-CAT.                 04-18-73      K =1.001     HUM = 75.4  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR                 MAN.
MODE           HC       CO    CO2      NO    CARBON    CONS.      HC      CO    NO2    FACT.    HC        CO     NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         112    .480  11.57      72    12.171    1679       17     133      3    .232     3.9       31      .8     0    18.6
2 30 PCT T      70    .030  12.72    1369    12.826    9662       57      46    349    .077     4.4        4    26.9    29    14.3
3 60 PCT T      53    .290  13.55     659    13.897   17196       71     723    270    .147    10.4      106    39.7    57     9.8
4 30 PCT T      39    .020  13.13    1770    13.192    9662       31      30    430    .077     2.4        2    33.1    29    14.3
5 10 PCT T      27    .010  12.59     569    12.629    6350       15      10     95    .057      .8        1     5.4    10    18.0
6 30 PCT T      35    .020  12.86    1504    12.918    9662       28      30    373    .077     2.2        2    28.8    29    14.3
7 90 PCT T     154   5.820  11.32     830    17.306   21250      204   14435    338    .113    23.1     1631    38.2    86     2.2
8 30 PCT T      41    .040  13.27    1791    13.354    9662       32      58    430    .077     2.5        5    33.1    29    14.3
9 C.T.         749    .040   7.51      72     8.359    1683      163      16      5    .143    23.3        2      .7     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          2.7       65     7.5
1 IDLE         112    .480  11.57      72    12.171    1679       17     133      3    .232     3.9       31      .8     0    18.6
2 30 PCT T      27    .030  12.92    1584    12.979    9662       22      45    391    .077     1.7        3    30.1    29    14.3
3 60 PCT T      23    .310  13.61     705    13.945   17196       31     770    288    .147     4.5      113    42.3    57     9.8
4 30 PCT T      27    .030  13.13    1770    13.189    9662       21      44    430    .077     1.6        3    33.1    29    14.3
5 10 PCT T      26    .010  12.52     555    12.558    6350       14      10     93    .057      .8        1     5.3    10    18.0
6 30 PCT T      29    .020  12.86    1294    12.911    9662       23      30    321    .077     1.8        2    24.8    29    14.3
7 90 PCT T     117   3.700  12.32    1426    16.146   21250      166    9836    623    .113    18.8     1112    70.4    86     2.2
8 30 PCT T      37    .030  13.13    1444    13.200    9662       29      44    472    .077     2.3        3    36.4    29    14.3
9 C.T.         730    .030   7.38      85     8.198    1683      162      12      6    .143    23.1        2      .8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          2.1       46     8.9
1 IDLE         112    .450  11.88      72    12.451    1679       16     122      3    .232     3.8       28      .7     0    18.6
2 30 PCT T      51    .020  12.59    1686    12.665    9662       42      31    427    .077     3.2        2    32.9    29    14.3
3 60 PCT T      29    .200  13.41     846    13.641   17196       39     508    353    .147     5.8       75    51.9    57     9.8
4 30 PCT T      27    .020  12.86    1922    12.909    9662       22      30    478    .077     1.7        2    36.8    29    14.3
5 10 PCT T      23    .010  12.39     659    12.428    6350       13      10    112    .057      .7        1     6.4    10    18.0
6 30 PCT T      27    .010  12.72    1770    12.759    9662       22      15    445    .077     1.7        1    34.3    29    14.3
7 90 PCT T      93   2.960  12.72    1770    15.780   21250      135    8052    791    .113    15.3      910    89.4    86     2.2
8 30 PCT T      27    .030  12.79    1949    12.849    9662       22      46    485    .077     1.7        4    37.4    29    14.3
9 C.T.         710    .030   7.40      83     8.197    1683      157      12      6    .143    22.5        2      .8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          2.1       37    10.6
1 IDLE         112    .450  11.88      72    12.451    1679       16     122      3    .232     3.8       28      .7     0    18.6
2 30 PCT T      51    .030  12.59    1728    12.675    9662       42      46    437    .077     3.2        4    33.7    29    14.3
3 60 PCT T      37    .220  13.27     830    13.530   17196       51     563    349    .147     7.4       83    51.3    57     9.8
4 30 PCT T      32    .020  12.72    1770    12.775    9662       26      31    444    .077     2.0        2    34.2    29    14.3
5 10 PCT T      27    .010  12.26     674    12.299    6350       15      10    116    .057      .9        1     6.6    10    18.0
6 30 PCT T      25    .020  12.72    1856    12.767    9662       20      31    466    .077     1.6        2    35.9    29    14.3
7 90 PCT T     100   3.190  12.59    1770    15.888   21250      144    8619    786    .113    16.3      974    88.8    86     2.2
8 30 PCT T      32    .030  12.72    1933    12.785    9662       26      46    485    .077     2.0        4    37.3    29    14.3
9 C.T.         653    .030   7.45      80     8.185    1683      145      12      5    .143    20.7        2      .8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          2.1       40    10.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          2.4       56     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          2.1       39    10.6
FOUR CYCLE COMPOSITE -
                                          HC- NDIR 0.35(      2.4) + 0.65(      2.1) =      2.193   GM/BHP HR
                                          CO- NDIR 0.35(     55.7) + 0.65(     38.7) =     44.654   GM/BHP HR
                                          NO2-NDIR 0.35(      8.2) + 0.65(     10.6) =      9.744   GM/BHP HR
                                                              CORRECTED NO2 =      9.753   GM/BHP HR
                                                                       BSFC =       .714   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR                   MAN.
MODE           HC-FID    CO    CO2   NO-CL    CARBON    CONS.      HC      CO    NO2    FACT.   HC-FID      CO  NO2-CL    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        1878    .480  11.57      25    12.238    1679       26     133      1    .232     6.0       31      .3     0    18.6
2 30 PCT T     626    .030  12.72    1300    12.813    9662       47      46    325    .077     3.6        4    25.1    29    14.3
3 60 PCT T     479    .290  13.55     581    13.888   17196       59     723    238    .147     8.7      106    35.0    57     9.8
4 30 PCT T     336    .020  13.13    1718    13.184    9662       25      30    418    .077     1.9        2    32.2    29    14.3
5 10 PCT T     134    .010  12.59     512    12.613    6350        7      10     86    .057      .4        1     4.9    10    18.0
6 30 PCT T     264    .020  12.86    1475    12.907    9662       20      30    367    .077     1.5        2    28.2    29    14.3
7 90 PCT T    2697   5.820  11.32     725    17.405   21250      323   14354    294    .113    36.5     1622    33.2    86     2.2
8 30 PCT T     404    .040  13.27    1750    13.350    9662       29      58    420    .077     2.3        5    32.4    29    14.3
9 C.T.        7278    .040   7.51      88     8.277    1683      148      16      6    .143    21.2        2      .8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          3.0       65     7.0
1 IDLE        1878    .480  11.57      25    12.238    1679       26     133      1    .232     6.0       31      .3     0    18.6
2 30 PCT T     448    .030  12.92    1575    12.998    9662       33      45    389    .077     2.6        3    29.9    29    14.3
3 60 PCT T     446    .310  13.61     675    13.965   17196       55     769    275    .147     8.0      113    40.4    57     9.8
4 30 PCT T     258    .030  13.13    1775    13.186    9662       19      44    432    .077     1.5        3    33.2    29    14.3
5 10 PCT T     112    .010  12.52     525    12.591    6350        6      10     88    .057      .3        1     5.0    10    18.0
6 30 PCT T     224    .020  12.86    1262    12.908    9662       17      30    314    .077     1.3        2    24.2    29    14.3
7 90 PCT T    2847   3.700  12.32    1365    16.308   21250      371    9741    591    .113    41.9     1101    66.7    86     2.2
8 30 PCT T     319    .030  13.13    1925    13.191    9662       23      44    468    .077     1.8        3    36.0    29    14.3
9 C.T.        7266    .030   7.38      95     8.137    1683      150      13      7    .143    21.5        2      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          3.1       46     8.6
1 IDLE        2050    .450  11.88      25    12.535    1679       27     121      1    .232     6.4       28      .3     0    18.6
2 30 PCT T     480    .020  12.59    1700    12.658    9662       37      31    431    .077     2.8        2    33.2    29    14.3
3 60 PCT T     372    .200  13.41     800    13.647   17196       47     508    334    .147     6.9       75    49.1    57     9.8
4 30 PCT T     222    .020  12.86    1950    12.902    9662       17      30    485    .077     1.3        2    37.3    29    14.3
5 10 PCT T     100    .010  12.39     630    12.410    6350        5      10    107    .057      .3        1     6.1    10    18.0
6 30 PCT T     251    .010  12.72    1775    12.755    9662       19      15    446    .077     1.5        1    34.4    29    14.3
7 90 PCT T    2290   2.960  12.72    1743    15.909   21250      306    7987    773    .113    34.6      902    87.3    86     2.2
8 30 PCT T     252    .030  12.79    1975    12.845    9662       19      46    493    .077     1.5        4    38.0    29    14.3
9 C.T.        7695    .030   7.40     100     8.199    1683      158      12      7    .143    22.6        2     1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          2.8       37    10.9
1 IDLE        2050    .450  11.88      25    12.535    1679       27     121      1    .232     6.4       28      .3     0    18.6
2 30 PCT T     497    .030  12.59    1730    12.670    9662       38      46    438    .077     2.9        4    33.7    29    14.3
3 60 PCT T     360    .220  13.27     787    13.586   17196       46     563    331    .147     6.7       83    48.7    57     9.8
4 30 PCT T     201    .020  12.72    1787    12.760    9662       15      31    449    .077     1.2        2    34.6    29    14.3
5 10 PCT T     100    .010  12.26     650    12.290    6350        5      10    112    .057      .3        1     6.4    10    18.0
6 30 PCT T     274    .020  12.72    1900    12.767    9662       21      31    477    .077     1.6  [illegible]  36.8    29    14.3
7 90 PCT T    2722   3.190  12.59    1730    16.052   21250      360    8530    760    .112    40.7      964    85.9    86     2.2
8 30 PCT T     268    .030  12.72    1981    12.777    9662       20      46    497    .077     1.6        4    38.3    29    14.3
9 C.T.        7484    .030   7.45     100     8.228    1683      153      12      7    .143    21.9        2     1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          3.0       40    10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          3.0       55     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          2.9       38    10.4
FOUR CYCLE COMPOSITE -
                                          HC- FID  0.35(      3.0) + 0.65(      2.9) =      2.971   GM/BHP HR
                                          CO- NDIR 0.35(     55.3) + 0.65(     38.4) =     44.319   GM/BHP HR
                                          NO2-CL   0.35(      7.8) + 0.65(     10.4) =      9.516   GM/BHP HR
                                                              CORRECTED NO2 =      9.525   GM/BHP HR
                                                                       BSFC =       .714   LB/BHP HR
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                          TABLE B-25 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 2-2    TEST-9    RUN-3    EGR-CAT.              09-19-73      K =1.086      HUM =11      GR/LB
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                CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE              HC      CO     CO2     NO   CARBON   CONS.      HC      CO     NO2    FACT.    HC       CO    NO2    HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE            98    .380   11.32     73   11.806    1679      15     109       3    .232    3.5       25     .8     0    18.6
2 30 PCT T        61    .030   12.59   1240   12.686    9662      50      96     313    .077    3.9        9   24.1    29    19.3
3 60 PCT T        96    .300   13.69    599   14.090   17196      61     790     243    .147    8.9      109   35.7    57     9.8
4 30 PCT T        42    .020   13.13   1599   13.195    9662      33      30     375    .077    2.6        2   28.9    29    19.3
5 10 PCT T        33    .010   12.59    983   12.635    6350      18      10      81    .057    1.0        1    4.6    10    18.0
6 30 PCT T        33    .010   12.86   1351   12.906    9662      27      15     336    .077    2.1        1   25.9    29    19.3
7 90 PCT T       113   3.370   12.59   1927   16.082   21250     161    8995     626    .113   18.2     1016   70.7    86     2.2
8 30 PCT T        42    .030   13.13   1569   13.205    9662      33      99     380    .077    2.6        3   29.3    29    19.3
9 C.T.           739    .040    7.61    130    8.448    1683     159      16       9    .143   22.7        2    1.2     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.4       42    8.1
1 IDLE            98    .380   11.32     73   11.806    1679      15     109       3    .232    3.5       25     .8     0    18.6
2 30 PCT T        51    .030   12.32   1370   12.405    9662      43      97     354    .077    3.3        9   27.3    29    19.3
3 60 PCT T        47    .280   13.13    659   13.461   17196      65     780     279    .147    9.5      106   41.0    57     9.8
4 30 PCT T        37    .020   12.59   1584   12.650    9662      31      31     402    .077    2.4        2   30.9    29    19.3
5 10 PCT T        33    .010   12.07    526   12.116    6350      19      11      92    .057    1.1        1    5.2    10    18.0
6 30 PCT T        37    .010   12.59   1524   12.640    9662      31      15     387    .077    2.4        1   29.8    29    19.3
7 90 PCT T       117   5.280   12.07   1388   17.476   21250     159   12969     560    .113   17.9     1465   63.3    86     2.2
8 30 PCT T        28    .020   12.59   1686   12.640    9662      23      31     428    .077    1.8        2   32.9    29    19.3
9 C.T.           735    .030    7.43    130    8.254    1683     162      12       9    .143   23.1        2    1.3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.3       58    8.5
1 IDLE           136    .790   10.96     98   11.897    1679      21     226       5    .232    4.8       52    1.1     0    18.6
2 30 PCT T        61    .030   12.20   1985   12.296    9662      52      98     387    .077    4.0        9   29.8    29    19.3
3 60 PCT T        37    .260   12.86    705   13.160   17196      52     689     305    .147    7.7      101   44.8    57     9.8
4 30 PCT T        37    .020   12.32   1599   12.380    9662      31      32     400    .077    2.4        2   30.8    29    19.3
5 10 PCT T        25    .010   11.81    540   11.847    6350      14      11      96    .057     .8        1    5.5    10    18.0
6 30 PCT T        33    .010   12.07   1645   12.116    9662      28      16     436    .077    2.2        1   33.5    29    19.3
7 90 PCT T       103   3.190   11.81   1564   15.111   21250     156    9062     730    .113   17.7     1024   82.5    86     2.2
8 30 PCT T        37    .030   12.20   1749   12.270    9662      31      98     457    .077    2.4        9   35.2    29    19.3
9 C.T.           719    .040    7.09    175    7.907    1683     166      17      12    .143   23.6        2    1.8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.4       43    9.7
1 IDLE           136    .790   10.96     98   11.897    1679      21     225       5    .232    4.8       52    1.1     0    18.6
2 30 PCT T        61    .030   11.94   1985   12.036    9662      53      99     396    .077    4.1        9   30.5    29    19.3
3 60 PCT T        37    .250   12.59    734   12.880   17196      53     672     325    .147    7.8       99   47.8    57     9.8
4 30 PCT T        37    .010   12.07   1605   12.120    9662      32      16     425    .077    2.5        1   32.7    29    19.3
5 10 PCT T        28    .010   11.57    570   11.610    6350      17      11     104    .057     .9        1    5.9    10    18.0
6 30 PCT T        37    .010   12.07   1645   12.120    9662      32      16     435    .077    2.5        1   33.5    29    19.3
7 90 PCT T       122   5.040   11.32   1351   16.492   21250     170   13118     578    .113   19.2     1482   65.3    36     2.2
8 30 PCT T        37    .030   12.20   1687   12.270    9662      31      98     441    .077    2.4        9   34.0    29    19.3
9 C.T.           711    .030    7.03    132    7.828    1683     165      13       9    .143   23.6        2    1.3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.5       60    9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    2.4       51    8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    2.4       52    9.4
FOUR CYCLE COMPOSITE =
                                             HC- NDIR 0.35(    2.4) + 0.65(    2.4) =    2.408   GM/BHP HR
                                             CO- NDIR 0.35(   50.8) + 0.65(   51.7) =   51.247   GM/BHP HR
                                             NO2-NDIR 0.35(    8.3) + 0.65(    9.4) =    9.022   GM/BHP HR
                                                              CORRECTED NO2 =    9.799   GM/BHP HR
                                                                       BSFC =     .714   LB/BHP HR


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                CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE            HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          1308    .380   11.32     31   11.831    1679      19     109       1    .232    4.4       25     .3     0    18.6
2 30 PCT T       547    .030   12.59   1187   12.675    9662      42      96     300    .077    3.2        9   23.1    29    19.3
3 60 PCT T       407    .300   13.69    560   14.031   17196      50     791     223    .147    7.3      109   32.8    57     9.8
4 30 PCT T       303    .020   13.13   1531   13.180    9662      22      30     373    .077    1.7        2   28.7    29    19.3
5 10 PCT T        89    .010   12.59    966   12.609    6350       5      10      76    .057     .3        1    4.3    10    18.0
6 30 PCT T       101    .010   12.86   1312   12.880    9662       8      15     327    .077     .6        1   25.2    29    19.3
7 90 PCT T      1991   3.370   12.59   1360   16.159   21250     262    8952     589    .113   29.6     1012   66.6    86     2.2
8 30 PCT T       314    .030   13.13   1575   13.191    9662      23      99     383    .077    1.8        3   29.5    29    19.3
9 C.T.          6210    .040    7.61     96    8.271    1683     126      16       6    .143   18.1        2     .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.4       42    7.7
1 IDLE          1308    .380   11.32     31   11.831    1679      19     109       1    .232    4.4       25     .3     0    18.6
2 30 PCT T       457    .030   12.32   1375   12.396    9662      36      97     356    .077    2.7        9   27.4    29    19.3
3 60 PCT T       393    .280   13.13    625   13.449   17196      50     781     265    .147    7.4      106   38.9    57     9.8
4 30 PCT T       223    .020   12.59   1600   12.632    9662      17      31     406    .077    1.3        2   31.3    29    19.3
5 10 PCT T        89    .010   12.07    530   12.089    6350       5      11      92    .057     .3        1    5.3    10    18.0
6 30 PCT T       112    .010   12.59   1531   12.611    9662       9      15     389    .077     .7        1   30.0    29    19.3
7 90 PCT T      2263   5.280   12.07   1330   17.576   21250     274   12895     534    .113   30.9     1457   60.3    86     2.2
8 30 PCT T       301    .020   12.59   1681   12.640    9662      23      31     427    .077    1.8        2   32.8    29    19.3
9 C.T.          5559    .030    7.43    115    8.016    1683     117      13       8    .143   16.7        2    1.1     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.4       58    8.3
1 IDLE          2089    .790   10.96     50   11.958    1679      29     223       2    .232    6.8       52     .5     0    18.6
2 30 PCT T       545    .030   12.20   1462   12.285    9662      43      98     382    .077    3.3        9   29.4    29    19.3
3 60 PCT T       392    .260   12.86    663   13.159   17196      51     684     287    .147    7.5      101   42.2    57     9.8
4 30 PCT T       201    .020   12.32   1563   12.360    9662      16      32     406    .077    1.2        2   31.2    29    19.3
5 10 PCT T        78    .010   11.81    513   11.828    6350       4      11      91    .057     .2        1    5.2    10    18.0
6 30 PCT T       178    .010   12.07   1663   12.098    9662      14      16     441    .077    1.1        1   34.0    29    19.3
7 90 PCT T      2169   3.190   11.81   1525   15.217   21250     303    8999     707    .113   34.2     1017   79.9    86     2.2
8 30 PCT T       262    .030   12.20   1763   12.256    9662      21      98     461    .077    1.6        9   35.5    29    19.3
9 C.T.          5990    .040    7.04    130    7.679    1683     120      18       9    .143   17.2        3    1.4     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.7       43    9.5
1 IDLE          2089    .790   10.96     50   11.958    1679      29     223       2    .232    6.8       52     .5     0    18.6
2 30 PCT T       494    .030   11.94   1500   12.019    9662      40      99     400    .077    3.1        9   30.8    29    19.3
3 60 PCT T       380    .250   12.59    700   12.878   17196      51     672     309    .147    7.4       99   45.5    57     9.8
4 30 PCT T       217    .010   12.07   1613   12.102    9662      17      16     428    .077    1.3        1   32.9    29    19.3
5 10 PCT T        89    .010   11.57    563   11.589    6350       5      11     102    .057     .3        1    5.8    10    18.0
6 30 PCT T       106    .010   12.07   1688   12.091    9662       8      16     448    .077     .6        1   34.5    29    19.3
7 90 PCT T      2599   5.040   11.32   1313   16.619   21250     326   13018     558    .113   36.8     1471   63.0    86     2.2
8 30 PCT T       267    .030   12.20   1713   12.257    9662      21      98     448    .077    1.6        9   34.5    29    19.3
9 C.T.          5327    .030    7.03    113    7.593    1683     118      13       8    .143   16.9        2    1.2     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.7       60    9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    2.4       50    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    2.7       51    9.3
FOUR CYCLE COMPOSITE =
                                             HC- FID  0.35(    2.4) + 0.65(    2.7) =    2.601   GM/BHP HR
                                             CO- NDIR 0.35(   50.3) + 0.65(   51.4) =   50.996   GM/BHP HR
                                             NO2-CL   0.35(    8.0) + 0.65(    9.3) =    8.821   GM/BHP HR
                                                              CORRECTED NO2 =    9.580   GM/BHP HR
                                                                       BSFC =     .714   LB/BHP HR
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TABLE B-24 MASS EMISSIONS BY 23-MODE PROCEDURE
ENGINE 2-0 TEST-7 RUN-1 1972 STANDARD ENGINE 04-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.6	3.8	16.1	0	3235	2.130	11.20	50
2	1200	5.0	1	19.9	7.2	16.4	0	990	.340	13.13	60
3	1200	18.0	4	19.2	7.7	16.4	0	1579	.260	13.55	330
4	1200	42.0	10	17.8	9.3	17.1	0	1935	.130	13.41	870
5	1200	58.0	13	16.7	10.6	17.4	0	1942	.100	13.13	1162
6	1200	115.0	26	11.1	14.8	18.1	0	2257	.080	12.59	2387
7	1200	173.0	40	3.7	22.0	17.4	0	1345	.110	12.99	2450
8	1200	188.0	43	2.6	22.9	16.7	0	1572	.120	13.13	2700
9	1200	212.0	48	1.7	25.7	15.6	0	2332	.700	13.55	2750
10	1200	230.0	53	.3	33.8	12.7	0	4343	6.480	10.96	662
11	600	0.0	0	18.6	3.8	15.7	0	3185	1.550	11.57	62
12	1200	0.0	0	22.5	3.8	20.5	0	41372	.260	5.73	25
13	2300	250.0	109	1.2	66.3	12.7	0	3252	6.150	11.32	875
14	2300	228.0	100	2.2	55.4	13.7	0	2511	3.800	12.59	1937
15	2300	205.0	90	2.5	49.6	15.4	0	341	1.230	13.69	1687
16	2300	187.0	82	4.0	46.4	16.0	0	340	.580	13.84	2225
17	2300	125.0	55	10.4	31.8	16.4	0	1628	.300	13.84	4250
18	2300	63.0	28	15.2	23.5	17.1	0	698	.190	13.41	2250
19	2300	45.0	20	16.7	18.8	17.5	0	438	.140	13.27	1400
20	2300	20.0	9	18.5	16.4	17.9	0	269	.120	12.99	712
21	2300	10.0	4	19.7	15.9	18.5	0	201	.090	12.46	350
22	600	0.0	0	18.6	4.4	16.4	0	3216	1.280	11.32	55
23	2300	0.0	0	24.3	3.9	26.7	0	26608	.200	4.94	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	40.8	543	2.1	.070	0.0	I	R	R	R
2	0.0	23.8	165	4.8	.060	.1	0.0	20.85	144.7	4.2
3	0.0	39.5	131	27.4	.060	.2	0.0	9.60	31.9	6.7
4	0.0	59.4	81	88.7	.050	.5	0.0	6.20	8.4	9.2
5	0.0	69.5	72	138.2	.030	.4	0.0	5.25	5.5	10.4
6	0.0	117.5	84	412.6	.060	1.6	0.0	4.47	3.2	15.7
7	0.0	101.4	168	613.3	0.000	0.0	0.0	2.57	4.2	15.5
8	0.0	121.8	188	694.5	.040	1.7	0.0	2.83	4.4	16.2
9	0.0	187.7	1138	734.9	0.000	0.0	0.0	3.87	23.5	15.2
10	0.0	372.5	11228	188.5	0.000	0.0	0.0	7.09	213.6	3.6
11	0.0	40.8	402	2.6	.070	0.0	I	R	R	R
12	0.0	704.2	89	1.4	.120	0.0	I	R	R	R
13	0.0	549.7	20995	490.9	.025	2.7	0.0	5.02	191.8	4.5
14	0.0	379.1	11591	971.1	.055	5.5	0.0	3.80	116.1	9.7
15	0.0	51.4	3738	842.6	.035	3.1	0.0	.57	41.6	9.4
16	0.0	49.5	1706	1075.7	.060	4.9	0.0	.60	20.8	13.1
17	0.0	164.2	611	1423.0	.060	3.3	0.0	3.00	11.2	26.0
18	0.0	54.4	299	582.5	0.000	0.0	0.0	1.97	10.8	21.1
19	0.0	27.8	179	294.6	.065	1.3	0.0	1.41	9.1	14.9
20	0.0	15.2	137	133.9	0.000	0.0	0.0	1.74	15.7	15.3
21	0.0	11.5	104	66.7	0.000	0.0	0.0	2.63	23.8	15.2
22	0.0	49.7	399	2.8	.080	0.0	I	R	R	R
23	0.0	603.4	92	1.1	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.980	GRAM/BHP HR
	CO	62.942	GRAM/BHP HR
	NO2	12.949	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.687	LB/BHP HR

TABLE B-25 MASS EMISSIONS BY 23-MODE PROCEDURE

ENGINE 2-0 TEST-7 RUN-2 1972 STANDARD ENGINE 04-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.7	4.8	16.4	0	3517	1.600	10.62	40
2	1200	5.0	1	19.9	7.5	16.5	0	696	.180	12.99	115
3	1200	18.0	4	19.3	8.2	16.4	0	1417	.240	13.27	250
4	1200	43.0	10	17.9	9.6	17.1	0	2198	.150	12.99	735
5	1200	57.0	13	16.7	10.3	17.5	0	2105	.100	12.86	1025
6	1200	116.0	27	11.2	15.0	18.2	0	2227	.080	12.20	2125
7	1200	174.0	40	3.9	21.8	17.4	0	1343	.130	12.72	2087
8	1200	188.0	43	2.7	23.5	16.8	0	1479	.140	12.86	2375
9	1200	212.0	48	1.7	25.7	15.5	0	2351	.940	13.13	2350
10	1200	234.0	53	.3	33.8	12.6	0	4357	6.550	10.62	562
11	600	0.0	0	18.6	4.0	15.4	0	3324	2.090	11.20	55
12	1200	0.0	0	22.5	3.7	20.6	0	40531	.340	5.66	15
13	2300	250.0	109	1.2	65.2	12.7	0	3711	6.080	11.20	835
14	2300	232.0	102	2.2	55.4	13.5	0	3109	4.310	12.07	1600
15	2300	206.0	90	2.4	49.9	15.4	0	455	1.160	13.69	1475
16	2300	186.0	81	4.0	45.8	16.1	0	340	.550	13.69	2012
17	2300	126.0	55	10.4	31.8	16.4	0	1751	.310	13.69	3850
18	2300	64.0	28	15.0	23.1	17.1	0	901	.220	13.41	2200
19	2300	46.0	20	16.6	19.8	17.5	0	494	.150	13.13	1300
20	2300	20.0	9	18.5	15.9	17.9	0	280	.120	12.86	600
21	2300	6.0	3	19.7	13.0	18.5	0	179	.090	12.46	270
22	600	0.0	0	18.6	3.9	16.4	0	3125	1.360	11.20	55
23	2300	0.0	0	24.3	3.8	25.9	0	31087	.200	4.47	20

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	60.4	560	2.3	.070	0.0	I	R	R	R
2	0.0	17.9	93	9.8	.060	.1	0.0	15.64	81.8	8.6
3	0.0	38.6	132	22.6	.060	.2	0.0	9.39	32.1	5.5
4	0.0	71.7	99	79.5	.050	.5	0.0	7.29	10.1	8.1
5	0.0	74.7	72	120.7	.030	.4	0.0	5.73	5.5	9.3
6	0.0	121.2	88	383.9	.060	1.6	0.0	4.57	3.3	14.5
7	0.0	102.3	200	527.7	0.000	0.0	0.0	2.57	5.0	13.3
8	0.0	119.9	229	639.3	.040	1.7	0.0	2.79	5.3	14.9
9	0.0	191.6	1547	635.8	0.000	0.0	0.0	3.95	31.9	13.1
10	0.0	379.4	11522	162.5	0.000	0.0	0.0	7.10	215.5	3.0
11	0.0	44.3	562	2.4	.070	0.0	I	R	R	R
12	0.0	676.6	115	.8	.120	0.0	I	R	R	R
13	0.0	621.9	20578	464.5	.025	2.7	0.0	5.68	188.0	4.2
14	0.0	468.1	13108	799.8	.055	5.6	0.0	4.61	129.0	7.9
15	0.0	69.1	3561	744.1	.035	3.2	0.0	.77	39.5	8.2
16	0.0	49.4	1617	972.2	.060	4.9	0.0	.61	19.9	11.9
17	0.0	178.2	637	1300.7	.060	3.3	0.0	3.23	11.5	23.6
18	0.0	68.8	339	557.8	0.000	0.0	0.0	2.45	12.1	19.9
19	0.0	33.3	204	290.8	.065	1.3	0.0	1.65	10.1	14.4
20	0.0	15.5	134	110.4	0.000	0.0	0.0	1.77	15.3	12.6
21	0.0	8.4	85	42.1	0.000	0.0	0.0	3.19	32.5	16.0
22	0.0	43.0	378	2.5	.080	0.0	I	R	R	R
23	0.0	688.9	90	1.5	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	8.399	GRAM/BHP HR
	CO	65.559	GRAM/BHP HR
	NO2	11.602	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.688	LB/BHP HR

TABLE B-26 MASS EMISSIONS BY 23-MODE PROCEDURE
ENGINE 2-0 TEST-7 RUN-3 1972 STANDARD ENGINE 04-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.6	4.7	16.0	0	3826	2.090	11.44	45
2	1200	5.0	1	20.0	8.2	16.5	0	811	.200	13.41	115
3	1200	18.0	4	19.1	8.0	16.4	0	1329	.280	13.41	275
4	1200	40.0	9	18.1	8.9	17.0	0	2119	.190	13.55	610
5	1200	58.0	13	16.6	10.4	17.4	0	2065	.110	13.13	987
6	1200	115.0	26	11.2	14.8	18.1	0	2187	.080	12.46	1475
7	1200	174.0	40	3.7	22.2	17.3	0	1459	.120	13.13	2087
8	1200	189.0	43	2.6	23.5	16.7	0	1482	.150	13.13	2237
9	1200	212.0	48	1.7	25.3	15.7	0	2145	.550	13.41	2362
10	1200	233.0	53	.3	33.4	12.8	0	4519	6.210	10.96	625
11	600	0.0	0	18.7	4.1	15.1	0	4031	2.530	11.08	50
12	1200	0.0	0	22.6	3.9	20.5	0	41186	.330	5.73	10
13	2300	254.0	111	1.2	65.5	12.9	0	3731	5.570	11.57	937
14	2300	230.0	101	2.1	55.4	14.1	0	1721	2.920	12.99	1750
15	2300	204.0	89	2.5	50.3	15.6	0	159	.700	13.98	1325
16	2300	188.0	82	4.1	45.0	16.1	0	283	.500	13.84	1925
17	2300	125.0	55	10.5	32.2	16.4	0	1503	.240	13.84	3850
18	2300	64.0	28	15.1	22.2	17.1	0	732	.170	13.55	1950
19	2300	45.0	20	16.7	19.4	17.5	0	483	.130	13.27	1300
20	2300	20.0	9	18.5	16.1	17.9	0	281	.110	13.13	625
21	2300	8.0	4	19.7	13.4	18.5	0	212	.070	12.59	310
22	600	0.0	0	18.7	3.8	16.5	0	3036	1.240	11.32	45
23	2300	0.0	0	24.4	3.8	26.6	0	27619	.180	4.81	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	58.6	647	2.3	.070	0.0	I	R	R	R
2	0.0	22.0	110	10.4	.060	.1	0.0	19.28	96.1	9.1
3	0.0	34.9	148	24.0	.060	.2	0.0	8.49	36.1	5.8
4	0.0	61.3	111	58.6	.050	.5	0.0	6.71	12.2	6.4
5	0.0	72.5	78	115.0	.030	.4	0.0	5.47	5.9	8.7
6	0.0	115.1	85	345.0	.060	1.6	0.0	4.38	3.2	13.1
7	0.0	109.7	182	520.9	0.000	0.0	0.0	2.76	4.6	13.1
8	0.0	117.7	241	589.6	.040	1.7	0.0	2.72	5.6	13.7
9	0.0	173.7	899	634.9	0.000	0.0	0.0	3.59	18.6	13.1
10	0.0	388.6	10785	178.4	0.000	0.0	0.0	7.30	202.6	3.4
11	0.0	53.5	678	2.2	.070	0.0	I	R	R	R
12	0.0	715.8	116	.6	.120	0.0	I	R	R	R
13	0.0	632.9	19088	527.8	.025	2.8	0.0	5.69	171.6	4.7
14	0.0	268.9	9217	907.9	.055	5.5	0.0	2.67	91.5	9.0
15	0.0	24.7	2195	683.0	.035	3.1	0.0	.28	24.6	7.6
16	0.0	40.2	1435	907.9	.060	4.9	0.0	.49	17.4	11.0
17	0.0	154.3	498	1311.9	.060	3.3	0.0	2.82	9.1	24.0
18	0.0	53.5	251	472.6	0.000	0.0	0.0	1.91	8.9	16.9
19	0.0	31.6	172	282.4	.065	1.3	0.0	1.60	8.7	14.3
20	0.0	15.4	122	114.2	0.000	0.0	0.0	1.76	14.0	13.0
21	0.0	10.2	68	49.3	0.000	0.0	0.0	2.90	19.3	14.1
22	0.0	40.7	336	2.0	.080	0.0	I	R	R	R
23	0.0	614.1	81	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.839	GRAM/BHP HR
	CO	53.666	GRAM/BHP HR
	NO2	11.480	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.689	LB/BHP HR

TABLE B-27 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 2-1 TEST-10 RUN-1 EGR-AIR-CAT. 04-22-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.5	4.3	22.4	0	394	.030	10.10	50
2	1200	5.0	1	20.2	7.4	24.8	0	152	.010	9.23	62
3	1200	18.0	4	19.3	8.3	23.9	0	196	.010	9.55	200
4	1200	41.0	9	17.9	9.3	22.9	0	327	.020	9.88	580
5	1200	58.0	13	16.3	10.5	22.6	0	371	.010	9.88	955
6	1200	116.0	27	10.8	15.3	21.8	0	624	.020	10.21	2200
7	1200	174.0	40	3.8	22.5	20.1	0	552	.030	11.22	2400
8	1200	189.0	43	2.3	23.8	20.5	0	510	.040	11.72	2450
9	1200	212.0	48	1.7	26.5	18.5	0	469	.110	12.59	2600
10	1200	232.0	53	.3	34.1	15.0	0	1793	4.160	11.98	735
11	600	0.0	0	18.6	3.9	21.2	0	197	.030	10.44	55
12	1200	0.0	0	22.5	3.9	30.2	0	9783	.030	5.59	10
13	2300	248.0	109	1.7	66.5	12.4	0	2592	5.570	11.41	730
14	2300	228.0	100	1.9	68.1	11.7	0	2979	7.500	10.21	415
15	2300	204.0	89	2.3	52.4	14.5	0	159	1.080	13.73	1012
16	2300	186.0	81	2.4	49.5	15.3	0	56	.130	13.88	887
17	2300	124.0	54	7.9	33.9	17.3	0	111	.040	12.05	1050
18	2300	62.0	27	14.9	22.7	19.3	0	165	.020	10.68	1337
19	2300	45.0	20	16.3	20.0	20.1	0	175	.020	10.33	850
20	2300	19.5	9	17.8	16.8	21.1	0	153	.020	9.88	475
21	2300	8.0	4	19.3	14.0	23.3	0	174	.020	9.12	205
22	600	0.0	0	18.4	3.9	21.5	0	261	.010	9.66	40
23	2300	0.0	0	24.2	3.8	48.0	0	9690	.020	3.32	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	7.6	12	3.2	.070	0.0	I	R	R	R
2	0.0	5.5	7	7.5	.060	.1	0.0	4.82	6.4	6.5
3	0.0	7.7	8	26.1	.060	.2	0.0	1.87	1.9	6.3
4	0.0	13.9	17	81.8	.050	.5	0.0	1.48	1.8	8.7
5	0.0	17.8	10	152.1	.030	.4	0.0	1.34	.7	11.5
6	0.0	42.1	27	492.5	.060	1.6	0.0	1.59	1.0	18.6
7	0.0	44.8	55	719.3	0.000	0.0	0.0	1.25	1.4	18.1
8	0.0	46.6	74	743.5	.040	1.7	0.0	1.08	1.7	17.2
9	0.0	44.3	210	814.0	0.000	0.0	0.0	.91	4.3	16.8
10	0.0	169.9	7965	231.3	0.000	0.0	0.0	3.21	150.3	4.4
11	0.0	3.3	10	3.1	.070	0.0	I	R	R	R
12	0.0	262.3	16	.9	.120	0.0	I	R	R	R
13	0.0	453.5	19687	424.1	.025	2.7	0.0	4.18	181.3	3.9
14	0.0	511.1	25988	236.3	.055	5.5	0.0	5.12	260.3	2.4
15	0.0	25.5	3498	538.6	.035	3.1	0.0	.29	39.1	6.0
16	0.0	9.0	421	471.8	.060	4.9	0.0	.11	5.2	5.8
17	0.0	14.1	103	443.0	.060	3.3	0.0	.26	1.9	8.2
18	0.0	15.8	39	426.5	0.000	0.0	0.0	.58	1.4	15.7
19	0.0	15.3	35	246.9	.065	1.3	0.0	.78	1.8	12.5
20	0.0	11.7	31	121.2	0.000	0.0	0.0	1.38	3.6	14.2
21	0.0	12.0	28	47.2	0.000	0.0	0.0	3.43	8.0	13.5
22	0.0	4.8	4	2.4	.080	0.0	I	R	R	R
23	0.0	387.6	16	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	4.158	GRAM/BHP HR
	CO	82.704	GRAM/BHP HR
	NO2	7.289	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.741	LB/BHP HR

TABLE B-28 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 2-1 TEST-10 RUN-2 EGR-AIR-CAT. 04-23-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.7	3.8	23.6	0	281	.010	8.82	30
2	1200	4.0	1	19.7	7.6	25.3	0	130	.010	8.82	70
3	1200	18.0	4	19.2	8.0	24.3	0	174	.010	9.23	140
4	1200	40.0	9	17.8	9.2	23.2	0	316	.010	9.55	425
5	1200	57.0	13	16.2	10.6	22.8	0	349	.010	9.66	635
6	1200	115.0	26	10.7	15.0	21.8	0	553	.010	10.21	1525
7	1200	172.0	39	3.8	22.0	20.1	0	519	.020	11.16	1650
8	1200	188.0	43	2.3	23.5	20.6	0	553	.040	11.41	1687
9	1200	212.0	48	1.7	25.9	18.5	0	513	.090	12.45	1850
10	1200	229.0	52	.3	33.1	15.2	0	1659	3.560	12.05	500
11	600	0.0	0	18.8	3.7	21.9	0	250	.010	9.55	35
12	1200	0.0	0	22.5	3.7	31.1	0	10987	.010	5.00	5
13	2300	246.0	108	1.7	64.9	12.6	0	1631	5.270	11.66	545
14	2300	228.0	100	1.8	67.7	11.9	0	2139	7.120	10.44	315
15	2300	204.0	89	2.3	52.4	14.8	0	79	.380	14.18	975
16	2300	186.0	81	2.4	48.9	15.3	0	68	.070	13.58	812
17	2300	124.0	54	7.9	33.5	17.3	0	111	.030	12.18	987
18	2300	61.0	27	14.9	22.3	19.2	0	176	.020	10.80	1312
19	2300	45.0	20	16.2	20.0	20.0	0	175	.020	10.44	875
20	2300	19.0	8	17.9	16.7	21.1	0	175	.020	9.88	450
21	2300	8.0	4	19.4	13.7	23.4	0	206	.020	9.02	185
22	600	0.0	0	18.6	3.8	21.8	0	271	.020	9.23	35
23	2300	0.0	0	24.1	3.7	49.1	0	11910	.030	2.86	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	5.5	4	1.9	.070	0.0	I	R	R	R
2	0.0	5.1	8	9.1	.060	.1	0.0	5.54	8.6	9.9
3	0.0	6.8	8	18.2	.060	.2	0.0	1.66	1.9	4.4
4	0.0	13.7	9	61.4	.050	.5	0.0	1.50	1.0	6.7
5	0.0	17.3	10	104.4	.030	.4	0.0	1.33	.8	8.0
6	0.0	36.6	13	335.3	.060	1.6	0.0	1.39	.5	12.8
7	0.0	46.1	36	486.7	0.000	0.0	0.0	1.17	.9	12.4
8	0.0	51.2	75	518.9	.040	1.7	0.0	1.19	1.7	12.1
9	0.0	47.9	170	573.1	0.000	0.0	0.0	.99	3.5	11.8
10	0.0	157.9	6844	158.0	0.000	0.0	0.0	3.02	130.8	3.0
11	0.0	4.4	4	2.0	.070	0.0	I	R	R	R
12	0.0	301.4	6	.5	.120	0.0	I	R	R	R
13	0.0	280.9	18334	311.6	.025	2.7	0.0	2.61	170.2	2.9
14	0.0	369.5	24849	180.7	.055	5.5	0.0	3.70	248.9	1.8
15	0.0	13.0	1252	528.1	.035	3.1	0.0	.15	14.0	5.9
16	0.0	11.0	230	437.9	.060	4.9	0.0	.13	2.8	5.4
17	0.0	13.8	75	407.4	.060	3.3	0.0	.25	1.4	7.5
18	0.0	16.4	38	406.6	0.000	0.0	0.0	.61	1.4	15.2
19	0.0	15.2	35	251.5	.065	1.3	0.0	.77	1.8	12.8
20	0.0	13.3	31	114.1	0.000	0.0	0.0	1.60	3.7	13.7
21	0.0	14.1	28	42.1	0.000	0.0	0.0	4.03	7.9	12.0
22	0.0	5.0	8	2.2	.080	0.0	I	R	R	R
23	0.0	489.8	25	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	4.096	GRAM/BHP HR
	CO	75.380	GRAM/BHP HR
	NO2	6.057	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.734	LB/BHP HR

TABLE B-29 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 2-1 TEST-10 RUN-3 EGR-AIR-CAT. 04-23-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.6	3.8	24.2	0	248	.010	8.22	30
2	1200	50.0	11	19.5	7.6	26.6	0	86	.010	7.84	70
3	1200	18.0	4	19.2	8.2	25.8	0	172	.010	7.94	125
4	1200	40.0	9	17.8	9.2	24.5	0	323	.010	8.22	375
5	1200	56.0	13	16.3	10.5	24.1	0	366	.010	8.32	590
6	1200	115.0	26	10.8	15.0	22.8	0	585	.010	8.92	1337
7	1200	172.0	39	3.9	21.9	20.5	0	526	.030	10.44	1500
8	1200	188.0	43	2.3	24.0	20.9	0	572	.040	10.80	1662
9	1200	211.0	48	1.7	25.8	18.6	0	467	.100	12.05	1725
10	1200	228.0	52	.3	33.0	15.3	0	1336	3.460	11.92	465
11	600	0.0	0	18.7	3.9	22.1	0	217	.020	9.23	35
12	1200	0.0	0	22.4	3.8	33.5	0	8966	.010	4.59	10
13	2300	246.0	108	1.3	65.1	13.6	0	343	2.660	12.72	575
14	2300	228.0	100	1.7	69.7	12.6	0	1175	5.270	11.16	245
15	2300	205.0	90	2.3	54.6	14.9	0	57	.190	13.88	1000
16	2300	186.0	81	2.4	49.4	15.3	0	67	.060	12.86	725
17	2300	125.0	55	7.9	34.4	17.6	0	132	.040	11.04	862
18	2300	61.0	27	14.9	22.6	19.7	0	153	.020	9.77	1187
19	2300	45.0	20	16.2	20.0	20.7	0	152	.010	9.33	812
20	2300	20.0	9	17.8	16.9	21.9	0	108	.010	8.82	395
21	2300	8.0	4	19.3	13.9	24.1	0	129	.010	8.32	170
22	600	0.0	0	18.8	3.7	23.8	0	171	.010	7.21	30
23	2300	0.0	0	24.2	3.6	89.5	0	6881	.010	1.28	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	5.2	4	2.1	.070	0.0	I	R	R	R
2	0.0	3.8	9	10.2	.060	.7	0.0	.33	.8	.9
3	0.0	8.0	9	19.4	.060	.2	0.0	1.95	2.3	4.7
4	0.0	16.3	10	62.9	.050	.5	0.0	1.78	1.1	6.9
5	0.0	20.8	11	111.5	.030	.4	0.0	1.63	.9	8.7
6	0.0	44.3	15	336.0	.060	1.6	0.0	1.68	.6	12.8
7	0.0	49.7	57	470.1	0.000	0.0	0.0	1.26	1.5	12.0
8	0.0	57.2	81	551.2	.040	1.7	0.0	1.33	1.9	12.8
9	0.0	44.8	194	549.5	0.000	0.0	0.0	.93	4.0	11.4
10	0.0	129.0	6744	149.0	0.000	0.0	0.0	2.48	129.5	2.9
11	0.0	4.1	8	2.2	.070	0.0	I	R	R	R
12	0.0	281.2	6	1.0	.120	0.0	I	R	R	R
13	0.0	65.6	10294	365.7	.025	2.7	0.0	.61	95.5	3.4
14	0.0	224.5	20339	155.4	.055	5.5	0.0	2.25	203.7	1.6
15	0.0	9.9	675	584.2	.035	3.1	0.0	.11	7.5	6.5
16	0.0	11.6	210	417.2	.060	4.9	0.0	.14	2.6	5.1
17	0.0	18.6	114	402.5	.060	3.3	0.0	.34	2.1	7.4
18	0.0	16.0	42	412.0	0.000	0.0	0.0	.60	1.6	15.4
19	0.0	14.7	20	261.4	.065	1.3	0.0	.75	1.0	13.3
20	0.0	9.4	18	113.7	0.000	0.0	0.0	1.07	2.0	13.0
21	0.0	9.8	15	42.7	0.000	0.0	0.0	2.79	4.4	12.2
22	0.0	4.0	5	2.3	.080	0.0	I	R	R	R
23	0.0	568.0	17	1.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	3.598	GRAM/BHP HR
	CO	55.301	GRAM/BHP HR
	NO2	6.015	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.727	LB/BHP HR

TABLE B-30 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 2-2 TEST-11 RUN-1 EGR-CAT. 04-22-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION			
								HC	CO	CO2	NO
1	600	0.0	0	18.9	3.8	16.9	0	1851	.280	12.18	25
2	1200	4.6	1	19.8	7.5	17.0	0	167	.010	12.45	95
3	1200	18.5	4	19.3	8.3	16.7	0	313	.010	12.72	185
4	1200	41.0	9	17.8	9.6	16.8	0	447	.010	12.59	585
5	1200	57.0	13	16.3	10.6	17.3	0	434	.010	12.31	870
6	1200	115.0	26	10.8	15.3	17.7	0	622	.010	12.05	1975
7	1200	174.0	40	3.9	22.1	16.9	0	570	.030	12.72	2025
8	1200	190.0	43	2.3	23.6	16.8	0	635	.030	12.31	2100
9	1200	212.0	48	1.7	25.4	16.2	0	1096	.300	13.73	2050
10	1200	230.0	53	.3	33.9	12.2	0	4236	6.210	10.80	560
11	600	0.0	0	18.8	3.6	16.6	0	2091	.090	12.05	40
12	1200	0.0	0	23.1	3.7	24.0	0	5531	.010	9.12	10
13	2300	248.0	109	1.7	65.1	12.2	0	3480	6.020	11.28	730
14	2300	228.0	100	2.0	68.6	12.0	0	3574	6.420	10.92	705
15	2300	204.0	89	2.3	52.0	14.1	0	866	1.600	13.43	1213
16	2300	186.0	81	2.4	49.0	14.6	0	193	.930	13.88	900
17	2300	125.0	55	8.0	33.8	15.3	0	497	.120	13.88	1162
18	2300	62.0	27	14.9	22.5	15.9	0	292	.030	13.43	1900
19	2300	45.0	20	16.3	20.0	16.1	0	191	.010	13.29	1250
20	2300	20.0	9	17.9	16.7	16.3	0	123	.010	12.86	575
21	2300	8.0	4	19.5	13.9	16.5	0	100	.010	12.31	250
22	600	0.0	0	18.9	3.5	16.9	0	776	.030	11.66	35
23	2300	0.0	0	24.2	3.7	29.8	0	10709	.030	5.36	5

MODE	CALCULATED GRAM/HR				WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR			
	ALDE.	HC	CO	NO2			ALDE.	HC	CO	NO2
1	0.0	25.2	77	1.1	.070	0.0	I	R	R	R
2	0.0	4.6	6	8.6	.060	.1	0.0	4.34	5.2	8.2
3	0.0	9.2	6	18.1	.060	.3	0.0	2.18	1.4	4.3
4	0.0	15.4	7	66.9	.050	.5	0.0	1.64	.7	7.1
5	0.0	16.4	8	112.3	.030	.4	0.0	1.30	.6	8.6
6	0.0	35.6	12	375.4	.060	1.6	0.0	1.36	.4	14.3
7	0.0	44.6	47	526.2	0.000	0.0	0.0	1.12	1.2	13.2
8	0.0	54.8	52	601.7	.040	1.7	0.0	1.26	1.2	13.9
9	0.0	89.3	494	554.6	0.000	0.0	0.0	1.84	10.2	11.4
10	0.0	373.6	11064	164.0	0.000	0.0	0.0	7.11	210.5	3.1
11	0.0	27.7	24	1.8	.070	0.0	I	R	R	R
12	0.0	95.9	4	.6	.120	0.0	I	R	R	R
13	0.0	582.3	20347	405.5	.025	2.7	0.0	5.36	187.3	3.7
14	0.0	628.4	22802	411.5	.055	5.5	0.0	6.29	228.4	4.1
15	0.0	135.1	5043	628.4	.035	3.1	0.0	1.51	56.4	7.0
16	0.0	24.0	2816	447.8	.060	4.9	0.0	.36	34.6	5.5
17	0.0	54.2	265	421.0	.060	3.3	0.0	.99	4.8	7.7
18	0.0	22.1	46	477.3	0.000	0.0	0.0	.81	1.7	17.6
19	0.0	13.0	14	282.7	.065	1.3	0.0	.66	.7	14.3
20	0.0	7.2	12	112.3	0.000	0.0	0.0	.83	1.4	12.8
21	0.0	5.1	10	42.4	0.000	0.0	0.0	1.46	2.9	12.1
22	0.0	10.5	8	1.6	.080	0.0	I	R	R	R
23	0.0	276.2	16	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	3.911	GRAM/BHP HR
	CO	84.596	GRAM/BHP HR
	NO2	7.145	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.734	LB/BHP HR

TABLE B-31 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 2-2 TEST-11 RUN-2 EGR-CAT. 04-25-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.9	3.7	16.9	0	1588	.180	12.59	35
2	1200	6.0	1	19.5	7.7	16.9	0	168	.010	12.86	130
3	1200	18.0	4	19.1	8.0	16.6	0	292	.010	13.14	205
4	1200	40.0	9	17.9	9.2	16.8	0	426	.010	13.00	550
5	1200	58.0	13	16.3	10.2	17.3	0	391	.010	12.59	900
6	1200	115.0	26	10.9	14.9	17.6	0	635	.010	12.31	1913
7	1200	172.0	39	3.8	21.2	16.9	0	671	.020	12.86	1850
8	1200	189.0	43	2.2	23.7	16.7	0	527	.040	13.00	1925
9	1200	212.0	48	1.7	26.0	15.9	0	1361	.750	13.73	1725
10	1200	230.0	53	.3	33.5	12.2	0	3893	6.350	10.80	550
11	600	0.0	0	18.6	3.7	16.3	0	2510	.440	12.59	45
12	1200	0.0	0	22.3	3.7	23.6	0	10125	.020	8.32	10
13	2300	246.0	108	1.3	65.3	12.2	0	3293	6.080	11.16	670
14	2300	228.0	100	1.7	69.5	11.2	0	4075	8.820	9.66	320
15	2300	203.0	89	2.3	52.2	13.8	0	960	2.330	13.14	1150
16	2300	187.0	82	2.4	49.2	14.5	0	273	1.240	13.73	850
17	2300	125.0	55	7.9	33.8	15.3	0	508	.160	13.80	1075
18	2300	62.0	27	15.0	22.0	15.9	0	214	.030	13.73	1675
19	2300	45.0	20	16.3	19.7	16.0	0	135	.020	13.58	1188
20	2300	20.0	9	18.0	16.3	16.3	0	45	.010	13.14	588
21	2300	8.0	4	19.3	13.5	16.5	0	45	.010	12.59	270
22	600	0.0	0	19.0	3.7	16.6	0	1298	.170	12.72	40
23	2300	0.0	0	24.2	3.5	26.6	0	11284	.030	6.95	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	20.6	47	1.5	.070	0.0	I	R	R	R
2	0.0	4.5	5	11.7	.060	.1	0.0	3.32	4.0	8.5
3	0.0	8.0	6	18.7	.060	.2	0.0	1.95	1.4	4.6
4	0.0	13.6	6	58.4	.050	.5	0.0	1.49	.7	6.4
5	0.0	14.3	7	109.4	.030	.4	0.0	1.08	.6	8.3
6	0.0	34.7	11	346.6	.060	1.6	0.0	1.32	.4	13.2
7	0.0	49.9	30	456.2	0.000	0.0	0.0	1.27	.8	11.6
8	0.0	43.2	66	524.8	.040	1.7	0.0	1.00	1.5	12.2
9	0.0	109.8	1222	462.1	0.000	0.0	0.0	2.27	25.2	9.5
10	0.0	337.9	11113	158.2	0.000	0.0	0.0	6.42	211.5	3.0
11	0.0	31.7	112	1.9	.070	0.0	I	R	R	R
12	0.0	181.7	7	.6	.120	0.0	I	R	R	R
13	0.0	555.1	20706	375.0	.025	2.7	0.0	5.15	192.2	3.5
14	0.0	680.1	29737	177.3	.055	5.5	0.0	6.81	297.8	1.8
15	0.0	146.1	7159	580.8	.035	3.1	0.0	1.64	80.5	6.5
16	0.0	40.7	3727	419.9	.060	4.9	0.0	.50	45.5	5.1
17	0.0	55.3	352	388.3	.060	3.3	0.0	1.01	6.4	7.1
18	0.0	15.5	44	402.7	0.000	0.0	0.0	.57	1.6	14.8
19	0.0	8.4	27	258.9	.065	1.3	0.0	.45	1.3	13.1
20	0.0	2.5	11	109.7	0.000	0.0	0.0	.29	1.3	12.5
21	0.0	2.2	10	43.5	0.000	0.0	0.0	.62	2.8	12.4
22	0.0	16.7	44	1.7	.080	0.0	I	R	R	R
23	0.0	220.4	12	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE HC 4.294 GRAM/BHP HR
CO 105.731 GRAM/BHP HR
NO2 6.139 GRAM/BHP HR
ALDE 0.000 GRAM/BHP HR
BSFC .735 LB/BHP HR

TABLE B-32 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 2-2 TEST-11 RUN-3 EGR-CAT. 04-25-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	18.8	3.7	16.7	0	2239	.330	12.59	45
2	1200	5.0	1	19.6	7.6	16.9	0	224	.010	13.00	110
3	1200	19.5	4	19.3	7.9	16.6	0	370	.010	13.14	185
4	1200	42.0	10	17.9	9.2	16.7	0	504	.010	13.00	560
5	1200	58.0	13	16.4	10.3	17.2	0	480	.010	12.59	890
6	1200	116.0	27	11.0	14.9	17.6	0	668	.010	12.31	2025
7	1200	174.0	40	3.8	22.2	16.9	0	627	.020	12.86	1975
8	1200	189.0	43	2.4	23.0	16.7	0	639	.040	13.00	2088
9	1200	212.0	48	1.7	25.4	16.1	0	1199	.470	13.73	1925
10	1200	230.0	53	.3	33.2	12.6	0	4304	6.280	13.43	538
11	600	0.0	0	18.8	3.7	16.1	0	2962	.740	12.45	50
12	1200	0.0	0	22.4	3.7	26.1	0	1379	.020	8.32	15
13	2300	248.0	109	1.3	64.5	12.3	0	3334	5.760	11.28	770
14	2300	228.0	100	1.8	67.4	11.4	0	3944	8.050	9.99	420
15	2300	204.0	89	2.3	52.4	13.8	0	1098	2.370	13.14	1250
16	2300	186.0	81	2.4	48.6	14.5	0	227	1.050	13.73	825
17	2300	124.0	54	8.0	33.6	15.2	0	554	.220	14.01	1125
18	2300	61.0	27	15.0	22.1	15.9	0	259	.030	13.73	1813
19	2300	45.0	20	16.3	19.8	16.0	0	180	.020	13.58	1275
20	2300	20.0	9	18.0	16.6	16.2	0	90	.010	13.29	638
21	2300	8.0	4	19.4	13.2	16.5	0	45	.010	12.72	285
22	600	0.0	0	18.8	3.7	16.7	0	760	.030	12.72	45
23	2300	0.0	0	24.2	3.6	26.8	0	11897	.030	6.70	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	28.6	85	1.9	.070	0.0	I	R	R	R
2	0.0	5.9	5	9.7	.060	.1	0.0	5.19	4.7	8.5
3	0.0	10.1	5	16.7	.060	.3	0.0	2.26	1.2	3.7
4	0.0	16.1	6	59.4	.050	.5	0.0	1.68	.7	6.2
5	0.0	17.7	7	109.1	.030	.4	0.0	1.34	.6	8.2
6	0.0	36.5	11	366.8	.060	1.6	0.0	1.38	.4	13.8
7	0.0	48.8	31	510.2	0.000	0.0	0.0	1.23	.8	12.8
8	0.0	50.9	64	551.9	.040	1.7	0.0	1.18	1.5	12.8
9	0.0	46.5	764	514.2	0.000	0.0	0.0	1.99	15.8	10.6
10	0.0	321.8	9485	133.6	0.000	0.0	0.0	6.12	180.5	2.5
11	0.0	36.9	186	2.1	.070	0.0	I	R	R	R
12	0.0	27.3	8	1.0	.120	0.0	I	R	R	R
13	0.0	561.4	19594	430.5	.025	2.7	0.0	5.17	180.4	4.0
14	0.0	654.1	26968	231.3	.055	5.5	0.0	6.55	270.1	2.3
15	0.0	167.0	7285	631.5	.035	3.1	0.0	1.87	81.5	7.1
16	0.0	33.9	3159	407.9	.060	4.9	0.0	.42	38.8	5.0
17	0.0	59.2	474	398.5	.060	3.3	0.0	1.09	8.7	7.3
18	0.0	18.9	44	437.7	0.000	0.0	0.0	.71	1.6	16.4
19	0.0	11.9	27	279.2	.065	1.3	0.0	.60	1.4	14.2
20	0.0	5.1	11	119.8	0.000	0.0	0.0	.58	1.3	13.7
21	0.0	2.1	9	44.5	0.000	0.0	0.0	.60	2.7	12.7
22	0.0	4.9	8	2.0	.080	0.0	I	R	R	R
23	0.0	245.3	12	1.0	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	3.642	GRAM/BHP HR
	CO	97.803	GRAM/BHP HR
	NO2	6.510	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.726	LB/BHP HR

TABLE B-33.   VEHICLE EMISSION RESULTS

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UNIT NO.  2-1        TEST NO. 1           DATE  6/ 1/73
VEHICLE MODEL  STAKE                      ENGINE 2-1                       MFGR. CODE    2                YR.  1972
                                                                           CURB WT.      11,530           GVW  25,500
                                                                           LA-4 DYNO TEST WEIGHT 16,000

BAROMETER  29.15 IN.HG.
DRY BULB TEMP.  79.0 DEG. F                                                WET BULB TEMP 73.0 DEG. F
REL. HUMIDITY     73 PCT.                                                  ABS. HUMIDITY 102.9 GRAINS/LB

EVAPORATIVE EMISSIONS

    CANISTER                                1              2
    FINAL WT.,    GRAMS                  -0.00          -0.00
    INITIAL WT.,  GRAMS                  -0.00          -0.00
    DIFFERENCE    GRAMS                   0.00           0.00

    TOTAL EVAPORATIVE EMISSIONS                                       0.00 GRAMS

EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2,  12.5 IN. H2O                      BLOWER INLET PRESS., G1   7.5 IN. H2O
                                                               BLOWER INLET TEMP.  144 DEG. F
    BAG RESULTS
    BAG NO.                                    1              2              3
    BLOWER REVOLUTIONS                     10313          16603           9872
    HC   SAMPLE  METER READING/SCALE       46.6/3         18.2/3         25.2/3
    HC   SAMPLE  PPM                       466            182            252
    HC   BACKGRD METER READING/SCALE        2.2/3          2.8/3          2.6/3
    HC   BACKGRD PPM                        22             28             26
    CO   SAMPLE  METER READING/SCALE       53.8/1         21.9/1         45.4/1
    CO   SAMPLE  PPM                       5537           1556           4179
    CO   BACKGRD METER READING/SCALE        1.6/1          .3/1           .4/1
    CO   BACKGRD PPM                        95             18             24
    CO2  SAMPLE  METER READING/SCALE       62.5/2         53.1/2         62.4/2
    CO2  SAMPLE  PERCENT                   1.83           1.51           1.82
    CO2  BACKGRD METER READING/SCALE        1.7/2          2.3/2          3.0/2
    CO2  BACKGRD PERCENT                    .04            .06            .08
    NOX  SAMPLE  METER READING/SCALE       23.9/3         21.1/3         28.8/3
    NOX  SAMPLE  PPM                       71.7           63.3           86.4
    NOX  BACKGRD METER READING/SCALE        .4/3           .9/3          1.0/3
    NOX  BACKGRD PPM                        1.2            2.7            3.0

    HC   CONCENTRATION PPM                  448            158            230
    CO   CONCENTRATION PPM                 5136           1459           3915
    CO2  CONCENTRATION PCT                 1.79           1.46           1.76
    NOX  CONCENTRATION PPM                 70.7           60.9           83.9
    HC   MASS GRAMS                        39.04          22.10          19.22
    CO   MASS GRAMS                       903.68         413.23         659.33
    CO2  MASS GRAMS                      4977.43        6535.68        4651.86
    NOX  MASS GRAMS                        24.87          34.50          28.25

    WEIGHTED MASS HC       6.65 GRAMS/MILE
    WEIGHTED MASS CO     157.02 GRAMS/MILE
    WEIGHTED MASS CO2   1512.62 GRAMS/MILE
    WEIGHTED MASS NOX      3.17 GRAMS/MILE
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            TABLE B-34.        VEHICLE EMISSION RESULTS

UNIT NO.  2-1       TEST NO. 2        DATE  6/ 4/73
VEHICLE MODEL  STAKE                  ENGINE 2-1                   MFGR. CODE   2                  YR.  1972
                                                                   CURB WT.      11,530            GVW  25,500
                                                                   LA-4 DYNO TEST WEIGHT 16,000
BAROMETER  29.10 IN.HG.
DRY BULB TEMP.  80.0 DEG. F                                  WET BULB TEMP 72.0 DEG. F
REL. HUMIDITY     66 PCT.                                    ABS. HUMIDITY 105.4 GRAINS/LB

EVAPORATIVE EMISSIONS

    CANISTER                                   1             2
    FINAL WT.,    GRAMS                    -0.00         -0.00
    INITIAL WT.,  GRAMS                    -0.00         -0.00
    DIFFERENCE    GRAMS                     0.00          0.00

    TOTAL EVAPORATIVE EMISSIONS                                    0.00 GRAMS

EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2,  13.0 IN. H2O                    BLOWER INLET PRESS., G1   7.5 IN. H2O
                                                             BLOWER INLET TEMP.  147 DEG. F
    BAG RESULTS
    BAG NO.                                    1             2              3
    BLOWER REVOLUTIONS                     10366         16655           9599
    HC   SAMPLE  METER READING/SCALE        54.0/3        22.1/3          32.4/3
    HC   SAMPLE  PPM                         540           221             324
    HC   BACKGRD METER READING/SCALE         1.9/3         2.5/3           8.2/3
    HC   BACKGRD PPM                          19            25              82
    CO   SAMPLE  METER READING/SCALE        56.4/1        26.9/1          48.9/1
    CO   SAMPLE  PPM                        6025          2008            4708
    CO   BACKGRD METER READING/SCALE          .7/1          .4/1           3.6/1
    CO   BACKGRD PPM                          41            24             217
    CO2  SAMPLE  METER READING/SCALE        62.4/2        54.3/2          62.2/2
    CO2  SAMPLE  PERCENT                    1.82          1.55            1.82
    CO2  BACKGRD METER READING/SCALE         2.5/2         2.5/2           5.0/2
    CO2  BACKGRD PERCENT                     .06           .06             .13
    NOX  SAMPLE  METER READING/SCALE        23.0/3        21.5/3          27.0/3
    NOX  SAMPLE  PPM                        69.0          64.5            81.0
    NOX  BACKGRD METER READING/SCALE          .4/3          .4/3            .5/3
    NOX  BACKGRD PPM                         1.2           1.2             1.5

    HC   CONCENTRATION PPM                   524           199             256
    CO   CONCENTRATION PPM                  5653          1886            4267
    CO2  CONCENTRATION PCT                  1.77          1.50            1.71
    NOX  CONCENTRATION PPM                  68.0          63.5            79.8
    HC   MASS GRAMS                        45.55         27.81           20.59
    CO   MASS GRAMS                       991.08        531.25          692.84
    CO2  MASS GRAMS                      4905.34       6656.54         4388.63
    NOX  MASS GRAMS                        22.86         34.27           24.82

    WEIGHTED MASS HC        7.88 GRAMS/MILE
    WEIGHTED MASS CO      180.31 GRAMS/MILE
    WEIGHTED MASS CO2    1502.31 GRAMS/MILE
    WEIGHTED MASS NOX       7.77 GRAMS/MILE
```

TABLE B-35. VEHICLE EMISSION RESULTS

UNIT NO. 2-2 TEST NO. 3
VEHICLE MODEL STAKE
DATE 6/ 5/73
ENGINE 2-1
MFGR. CODE 2
CURB WT. 11,530
LA-4 DYNO TEST WEIGHT 16,000
YR. 1972
GVW 25,500

BAROMETER 29.14 IN.HG.
DRY BULB TEMP. 78.0 DEG. F
REL. HUMIDITY 73 PCT.
WET BULB TEMP 72.0 DEG. F
ABS. HUMIDITY 108.7 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 13.0 IN. H20
BLOWER INLET PRESS., G1 7.5 IN. H2O
BLOWER INLET TEMP. 141 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	10353	16612	9745
HC SAMPLE METER READING/SCALE	13.1/4	30.4/3	39.0/3
HC SAMPLE PPM	1310	304	390
HC BACKGRD METER READING/SCALE	2.3/3	.7/4	2.5/3
HC BACKGRD PPM	23	70	25
CO SAMPLE METER READING/SCALE	67.8/1	34.5/1	52.7/1
CO SAMPLE PPM	8689	2792	5341
CO BACKGRD METER READING/SCALE	1.0/1	.8/1	.7/1
CO BACKGRD PPM	59	47	41
CO2 SAMPLE METER READING/SCALE	60.1/2	51.8/2	58.5/2
CO2 SAMPLE PERCENT	1.74	1.47	1.69
CO2 BACKGRD METER READING/SCALE	2.0/2	2.8/2	2.6/2
CO2 BACKGRD PERCENT	.05	.07	.06
NOX SAMPLE METER READING/SCALE	20.2/3	17.3/3	24.8/3
NOX SAMPLE PPM	60.6	51.9	74.4
NOX BACKGRD METER READING/SCALE	.2/3	.5/3	.5/3
NOX BACKGRD PPM	.6	1.5	1.5
HC CONCENTRATION PPM	1292	243	369
CO CONCENTRATION PPM	8143	2608	5008
CO2 CONCENTRATION PCT	1.70	1.41	1.64
NOX CONCENTRATION PPM	60.1	50.6	73.2
HC MASS GRAMS	113.30	34.23	30.48
CO MASS GRAMS	1443.06	741.18	834.94
CO2 MASS GRAMS	4766.65	6319.59	4315.50
NOX MASS GRAMS	20.78	28.06	23.60

WEIGHTED MASS HC [illegible].98 GRAMS/MILE
WEIGHTED MASS CO [illegible].62 GRAMS/MILE
WEIGHTED MASS CO2 3.41 GRAMS/MILE
WEIGHTED MASS NOX 6.74 GRAMS/MILE

TABLE B-36. VEHICLE EMISSION RESULTS

UNIT NO. 2-2 TEST NO. 4
VEHICLE MODEL STAKE
DATE 6/ 6/73
ENGINE 2-1
MFGR. CODE 2
CURB WT. 11,530
LA-4 DYNO TEST WEIGHT 16,000
YR. 1972
GVW 25,500

BAROMETER 29.34 IN.HG.
DRY BULB TEMP. 77.0 DEG. F
REL. HUMIDITY 54 PCT.
WET BULB TEMP 66.0 DEG. F
ABS. HUMIDITY 78.1 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 13.0 IN. H2O
BLOWER INLET PRESS., G1 7.5 IN. H2O
BLOWER INLET TEMP. 135 DEG. F

BAG RESULTS			
BAG NO.	1	2	3
BLOWER REVOLUTIONS	9967	16338	9735
HC SAMPLE METER READING/SCALE	83.7/3	25.1/3	34.3/3
HC SAMPLE PPM	837	251	343
HC BACKGRD METER READING/SCALE	2.8/3	2.7/3	2.4/3
HC BACKGRD PPM	28	27	24
CO SAMPLE METER READING/SCALE	61.1/1	29.3/1	48.2/1
CO SAMPLE PPM	7008	2243	4598
CO BACKGRD METER READING/SCALE	1.2/1	1.0/1	.7/1
CO BACKGRD PPM	71	59	41
CO2 SAMPLE METER READING/SCALE	55.6/2	50.1/2	55.2/2
CO2 SAMPLE PERCENT	1.59	1.41	1.58
CO2 BACKGRD METER READING/SCALE	2.7/2	2.3/2	2.6/2
CO2 BACKGRD PERCENT	.07	.06	.06
NOX SAMPLE METER READING/SCALE	20.5/3	18.3/3	24.1/3
NOX SAMPLE PPM	61.5	54.9	72.3
NOX BACKGRD METER READING/SCALE	.4/3	.5/3	.6/3
NOX BACKGRD PPM	1.2	1.5	1.8
HC CONCENTRATION PPM	814	227	323
CO CONCENTRATION PPM	6613	2091	4344
CO2 CONCENTRATION PCT	1.54	1.36	1.53
NOX CONCENTRATION PPM	60.5	53.6	70.8
HC MASS GRAMS	69.91	32.01	27.07
CO MASS GRAMS	1146.88	594.56	735.80
CO2 MASS GRAMS	4211.46	6122.81	4079.83
NOX MASS GRAMS	17.49	25.39	19.98

WEIGHTED MASS HC 10.33 GRAMS/MILE
WEIGHTED MASS CO 200.95 GRAMS/MILE
WEIGHTED MASS CO2 1367.90 GRAMS/MILE
WEIGHTED MASS NOX 5.91 GRAMS/MILE

TABLE B-37.   VEHICLE EMISSION RESULTS

```
UNIT NO. 2-0        TEST NO. 5          DATE  6/ 7/73
VEHICLE MODEL  STAKE                    ENGINE 2-1             MFGR. CODE  2                     YR.  1972
                                                               CURB WT.     11,530               GVW  25,500
                                                               LA-4 DYNO TEST WEIGHT 16,000
BAROMETER  29.30 IN.HG.
DRY BULB TEMP.  73.0 DEG. F                                  WET BULB TEMP 63.0 DEG. F
REL. HUMIDITY     55 PCT.                                    ABS. HUMIDITY 70.0 GRAINS/LB

EVAPORATIVE EMISSIONS

     CANISTER                                  1                 2
     FINAL WT.,   GRAMS                     -0.00             -0.00
     INITIAL WT., GRAMS                     -0.00             -0.00
     DIFFERENCE   GRAMS                      0.00              0.00

     TOTAL EVAPORATIVE EMISSIONS
                                                                          0.00 GRAMS

EXHAUST EMISSIONS

     BLOWER DIF. PRESS., G2,  13.0 IN. H2O                      BLOWER INLET PRESS., G1   7.5 IN. H2O
                                                                BLOWER INLET TEMP.  130 DEG. F
     BAG RESULTS
     BAG NO.                                       1                 2                  3
     BLOWER REVOLUTIONS                         9784             16440               9774
     HC    SAMPLE  METER READING/SCALE        77.0/3            38.4/3             51.6/3
     HC    SAMPLE  PPM                          770               384                516
     HC    BACKGRD METER READING/SCALE         2.0/3             2.5/3              2.9/3
     HC    BACKGRD PPM                           20                25                 29
     CO    SAMPLE  METER READING/SCALE        60.0/1            30.9/1             51.6/1
     CO    SAMPLE  PPM                         6765              2405               5151
     CO    BACKGRD METER READING/SCALE         1.0/1             1.1/1               .9/1
     CO    BACKGRD PPM                           59                65                 53
     CO2   SAMPLE  METER READING/SCALE        59.5/2            49.8/2             56.7/2
     CO2   SAMPLE  PERCENT                     1.72              1.40               1.63
     CO2   BACKGRD METER READING/SCALE         2.0/2             2.2/2              2.0/2
     CO2   BACKGRD PERCENT                      .05               .05                .05
     NOX   SAMPLE  METER READING/SCALE        36.9/3            39.0/3             43.8/3
     NOX   SAMPLE  PPM                        110.7             117.0              131.4
     NOX   BACKGRD METER READING/SCALE          .9/3              .5/3               .6/3
     NOX   BACKGRD PPM                          1.2               1.5                1.8

     HC    CONCENTRATION PPM                    754               362                492
     CO    CONCENTRATION PPM                   6373              2241               4854
     CO2   CONCENTRATION PCT                   1.68              1.36               1.59
     NOX   CONCENTRATION PPM                  109.7             115.7              129.9
     HC    MASS GRAMS                         64.00             51.67              41.71
     CO    MASS GRAMS                       1092.57            645.73             831.35
     CO2   MASS GRAMS                       4556.79           6171.21            4295.33
     NOX   MASS GRAMS                         30.19             53.49              35.70

     WEIGHTED MASS HC      13.73 GRAMS/MILE
     WEIGHTED MASS CO     211.92 GRAMS/MILE
     WEIGHTED MASS CO2   1410.53 GRAMS/MILE
     WEIGHTED MASS NOX     11.58 GRAMS/MILE
```

TABLE B-38. VEHICLE EMISSION RESULTS

UNIT NO. 2-0 TEST NO. 6
VEHICLE MODEL STAKE

DATE 6/ 8/73
ENGINE 2-1

MFGR. CODE 2
CURB WT. 11,530
LA-4 DYNA TEST WEIGHT 16,000

YR. 1972
GVW 25,500

BAROMETER 29.25 IN.HG.
DRY BULB TEMP. 73.0 DEG. F
REL. HUMIDITY 59 PCT.

WET BULB TEMP 64.0 DEG. F
ABS. HUMIDITY 74.7 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 13.0 IN. H2O

BLOWER INLET PRESS., G1 7.5 IN. H2O
BLOWER INLET TEMP. 135 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	10053	16861	10091
HC SAMPLE METER READING/SCALE	78.5/3	34.7/3	48.9/3
HC SAMPLE PPM	785	347	489
HC BACKGRD METER READING/SCALE	2.6/3	2.7/3	2.3/3
HC BACKGRD PPM	26	27	23
CO SAMPLE METER READING/SCALE	60.0/1	28.5/1	49.8/1
CO SAMPLE PPM	6765	2163	4852
CO BACKGRD METER READING/SCALE	.7/1	.5/1	.4/1
CO BACKGRD PPM	41	29	24
CO2 SAMPLE METER READING/SCALE	58.2/2	50.5/2	55.5/2
CO2 SAMPLE PERCENT	1.68	1.43	1.59
CO2 BACKGRD METER READING/SCALE	2.1/2	2.2/2	2.0/2
CO2 BACKGRD PERCENT	.05	.05	.05
NOX SAMPLE METER READING/SCALE	38.3/3	42.2/3	46.9/3
NOX SAMPLE PPM	114.9	126.6	140.7
NOX BACKGRD METER READING/SCALE	.1/3	.4/3	.6/3
NOX BACKGRD PPM	.3	1.2	1.8
HC CONCENTRATION PPM	764	323	470
CO CONCENTRATION PPM	6385	2037	4592
CO2 CONCENTRATION PCT	1.64	1.38	1.55
NOX CONCENTRATION PPM	114.7	125.5	139.2
HC MASS GRAMS	65.96	46.90	40.71
CO MASS GRAMS	1113.33	596.58	803.78
CO2 MASS GRAMS	4507.95	6376.40	4278.95
NOX MASS GRAMS	32.80	60.32	39.97

WEIGHTED MASS HC 13.13 GRAMS/MILE
WEIGHTED MASS CO 204.46 GRAMS/MILE
WEIGHTED MASS CO2 1-33.94 GRAMS/MILE
WEIGHTED MASS NOX 12.96 GRAMS/MILE

APPENDIX C

TASK 3 - ENGINE 3

MASS EMISSION RESULTS BY:
NINE MODE FTP
NINE MODE EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY:
1975 LIGHT DUTY FTP

TABLE C-1. NINE-MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 3

			Composite Emissions Grams/Bhp-Hr					
			HC		CO	NO_2		
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp-Hr
13	1	1972 Standard Engine 5-03-73	3.78	4.78	15.70	10.85	11.03	0.620
13	2	1972 Standard Engine 5-03-73	3.83	4.87	19.66	10.79	10.77	0.620
13	3	1972 Standard Engine 5-03-73	4.08	4.71	15.29	11.34	11.31	0.620
13	4	1972 Standard Engine 5-03-73	3.50	4.30	15.76	10.84	10.86	0.619
		AVERAGE	3.80	4.67	16.60	10.96	10.99	0.620
15	1	1973 Standard Engine 5-07-73	3.15	4.60	24.38	8.24	7.79	0.695
15	2	1973 Standard Engine 5-07-73	3.51	4.53	31.50	8.43	8.35	0.695
15	3	1973 Standard Engine 5-07-73	4.86	4.73	31.67	8.23	7.89	0.695
		AVERAGE	3.84	4.62	29.18	8.30	8.01	0.695
70	1	1973 Standard Engine 8-16-73	3.79	4.62	32.98	6.38	6.76	0.732
70	2	1973 Standard Engine 8-16-73	3.34	4.43	30.32	7.13	6.70	0.732
70	3	1973 Standard Engine 8-16-73	3.56	4.48	33.53	6.35	6.22	0.732
		AVERAGE	3.56	4.51	32.28	6.62	6.56	0.732
87	1	1973 Standard Engine 9-06-73	4.00	5.63	39.38	6.72	6.23	0.716
97	1	1973 Standard Engine 9-17-73	4.27	6.25	44.90	6.83	6.24	0.783
97	2	1973 Standard Engine 9-17-73	4.47	6.31	46.62	6.45	6.07	0.783
97	3	1973 Standard Engine 9-17-73	4.45	6.40	45.52	7.33	6.61	0.783
		AVERAGE	4.40	6.32	45.68	6.87	6.31	0.783

TABLE C-1 (Cont'd). NINE-MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 3

			Composite Emissions Grams/Bhp-Hr					
			HC		CO	NO_2		
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp-Hr
89	1	O-Cat, Air, EGR	1.99	0.40	2.95	4.36	3.63	1.033
89	2	O-Cat, Air, EGR	1.77	0.47	5.33	4.25	3.62	1.033
		AVERAGE	1.88	0.44	4.14	4.31	3.63	1.033
73	1	O-Cat, Air, EGR, w/washer	1.24	0.28	5.04	4.55	4.25	0.892
73	2	O-Cat, Air, EGR w/ washer	1.40	0.23	3.91	4.63	4.23	0.892
73	3	O-Cat, Air, EGR w/ washer	1.35	0.26	3.89	4.46	4.14	0.892
		AVERAGE	1.33	0.26	4.28	4.54	4.21	0.892
80	1	Emission Cont. System	0.66	0.25	13.67	0.90	0.49	0.914
80	2	Emission Cont. System	0.79	0.08	10.37	1.32	0.28	0.914
83	1	Emission Cont. System	0.86	0.41	14.34	0.79	0.23	0.921
		AVERAGE	0.77	0.25	12.79	1.00	0.33	0.916
80	3	4 Degrees Ret., ECS	1.20	0.94	19.98	1.13	0.45	1.068
81	2	Leaner Carb. Jets, ECS	0.87	0.18	16.85	0.87	0.30	0.896
82	1	Richer Carb. Jets, ECS	0.77	0.16	21.98	0.79	0.35	1.019
86	1	Modally Optimized, ECS	0.72	0.09	1.80	0.42	0.15	0.939

*Engine 3-00, 1972 Standard Engine as in Test 13.
Engine 3-0, 1973 Standard Engine as in Tests 15, 70, 87, and 97.
Engine 3-1, Controlled Configuration as in Test 89.
Engine 3-1X, Controlled Configuration as in Test 73.
Engine 3-2, Emission Control System as in Tests 80, 81, 82, and 86.

TABLE C-2. NINE-MODE EPA COMPOSITE EMISSIONS SUMMARY FOR ENGINE 3

			Composite Emissions Grams/Bhp Hr					
			HC		CO	NO_2		
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp-Hr
14	1	1972 Standard Engine 5-04-73	3.55	4.00	15.83	11.66	11.34	0.619
14	2	1972 Standard Engine 5-04-73	3.56	5.10	16.76	11.06	11.06	0.619
14	3	1972 Standard Engine 5-04-73	3.43	4.37	16.61	11.15	11.03	0.619
		AVERAGE	3.51	4.49	16.40	11.29	11.14	0.619
71	1	1973 Standard Engine 8-16-73	3.29	4.91	38.21	5.73	4.93	0.673
71	2	1973 Standard Engine 8-16-73	3.42	4.68	36.15	6.23	6.03	0.673
71	3	1973 Standard Engine 8-16-73	3.21	4.77	33.65	6.44	6.16	0.673
		AVERAGE	3.31	4.79	36.00	6.13	5.71	0.673
90	1	O-Cat, Air, EGR	0.52	0.16	4.56	3.86	3.45	0.795
90	2	O-Cat, Air, EGR	0.87	0.24	2.67	4.01	3.59	0.795
		AVERAGE	0.70	0.20	3.62	3.94	3.52	0.795
91	5	O-Cat, Air, EGR, w/washer	0.88	0.22	2.10	4.14	3.69	0.799
91	6	O-Cat, Air, EGR, w/washer	1.72	0.26	3.50	3.65	2.99	0.799
91	7	O-Cat, Air, EGR, w/washer	0.99	0.22	2.82	4.07	3.70	0.799
		AVERAGE	1.20	0.23	2.81	3.95	3.46	0.799
84	1	Emission Cont. System	0.89	0.17	12.14	0.85	0.29	0.871
84	2	Emission Cont. System	0.69	0.05	9.92	0.83	0.29	0.871
84	3	Emission Cont. System	0.67	0.04	16.73	0.76	0.30	0.871
		AVERAGE	0.75	0.09	12.93	0.81	0.29	0.871

*Engine 3-00, 1972 Standard Engine as in Test 14.
Engine 3-0, 1973 Standard Engine as in Test 71.
Engine 3-1, Controlled Configuration as in Test 90.
Engine 3-1X, Controlled Configuration as in Test 91.
Engine 3-2, Emission Control System as in Test 84.

TABLE C-3. TWENTY-THREE MODE EPA COMPOSITE EMISSIONS SUMMARY FOR ENGINE 3

Test	Run	Engine Configuration*	Composite Emissions Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lbs/Bhp-Hr
95	1	1972 Standard Engine	----	7.72	93.16	----	4.86	0.671
95	2	1972 Standard Engine	----	8.24	95.89	----	5.44	0.671
95	3	1972 Standard Engine	----	7.75	86.75	----	5.66	0.671
		AVERAGE		7.90	91.93		5.32	0.671
88	1	1973 Standard Engine	----	10.61	95.25	----	4.41	0.708
88	2	1973 Standard Engine	----	10.02	94.26	----	4.57	0.709
88	3	1973 Standard Engine	----	10.08	92.71	----	4.56	0.704
		AVERAGE		10.24	94.07		4.51	0.707
93	1	O-Cat, Air, EGR w/ washer	----	0.60	14.84	----	2.62	0.727
93	2	O-Cat, Air, EGR w/ washer	----	0.62	12.44	----	3.04	0.731
93	3	O-Cat, Air, EGR w/ washer	----	0.59	13.90	----	2.93	0.733
		AVERAGE		0.60	13.73		2.86	0.730
85	2	Optimized Modally, ECS	----	0.05	3.28	----	0.28	1.000

*Engine 3-00, 1972 Standard Engine as in Test 95.
Engine 3-0, 1973 Standard Engine as in Test 88.
Engine 3-1X, Controlled Configuration as in Test 93.
Engine 3-2, Emission Control System as in Test 85.

```
                    TABLE C-4.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-00  TEST-13  RUN=1   1972 STANDARD ENGINE  05-03-73      K = .916      HUM = 52.3  GR/LB
----------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
MODE          HC       CO     CO2     NO  CARBON   CONS.      HC      CO    NO2   FACT.    HC       CO    NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------
1 IDLE        131   1.410   10.25     86  11.801    1769      21     427      4   .232     4.9      99    1.0     0    19.0
2 16 MG        74    .120   12.42   1090  12.620    8029      51     154    230   .077     3.9      12   17.7    28    16.0
3 10 MG        56    .110   12.79   1479  12.960   12202      57     209    462   .147     8.4      31   68.0    49    10.0
4 16 MG        56    .120   12.56   1226  12.740    8029      38     153    257   .077     2.9      12   19.8    28    16.0
5 19 MG        42    .120   12.66    565  12.825    6129      22     116     90   .057     1.2       7    5.1    14    19.0
6 16 MG        49    .120   12.55   1168  12.723    8029      33     153    245   .077     2.6      12   18.9    28    16.0
7  3 MG        84    .570   14.08   2667  14.741   19233     118    1502   1155   .113    13.4     170  130.5    88     3.0
8 16 MG        56    .140   13.05   1856  13.250    8029      37     171    373   .077     2.8      13   28.7    28    16.0
9 C.T.       2173    .370    6.70    135   9.417    1769     441     140      8   .143    63.0      20    1.2     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.9      14   11.0
1 IDLE        131   1.410   10.25     86  11.801    1769      21     427      4   .232     4.9      99    1.0     0    19.0
2 16 MG        74    .130   12.59   1355  12.800    8029      50     165    282   .077     3.9      13   21.7    28    16.0
3 10 MG        56    .120   13.03   1816  13.210   12202      56     224    557   .147     8.2      33   81.9    49    10.0
4 16 MG        56    .130   12.78   1536  12.970    8029      37     163    316   .077     2.9      13   24.3    28    16.0
5 19 MG        46    .120   12.93    738  13.100    6129      23     113    115   .057     1.3       6    6.5    14    19.0
6 16 MG        56    .120   12.79   1498  12.920    8029      38     151    309   .077     2.9      12   23.8    28    16.0
7  3 MG        90    .600   14.17   2731  14.867   19233     126    1568   1173   .113    14.2     177  132.5    88     3.0
8 16 MG        81    .140   12.88   1719  13.075    8029      34     174    350   .077     2.6      13   27.0    28    16.0
9 C.T.       1956    .360    6.92    109   9.392    1769     398     137      7   .143    56.9      20    1.0     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.7      15   12.1
1 IDLE        142   2.000   10.99     95  13.193    1769      21     544      4   .232     4.8     126    1.0     0    19.0
2 16 MG        72    .130   12.69   1239  12.898    8029      49     164    256   .077     3.7      13   19.7    28    16.0
3 10 MG        56    .120   13.11   1835  13.290   12202      56     223    559   .147     8.2      33   82.2    49    10.0
4 16 MG        56    .130   12.79   1511  12.930    8029      38     163    311   .077     2.9      13   24.0    28    16.0
5 19 MG        46    .120   12.99    784  13.160    6129      23     113    121   .057     1.3       6    6.9    14    19.0
6 16 MG        54    .130   12.87   1600  13.058    8029      36     161    327   .077     2.8      12   25.1    28    16.0
7  3 MG        90    .720   14.14   2666  14.957   19233     125    1870   1138   .113    14.1     211  128.6    88     3.0
8 16 MG        52    .140   12.86   1743  13.056    8029      35     174    356   .077     2.7      13   27.4    28    16.0
9 C.T.       2041    .350    6.73    103   9.284    1769     420     135      7   .143    60.1      19     .9     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.8      17   11.9
1 IDLE        142   2.000   10.99     95  13.193    1769      21     544      4   .232     4.8     126    1.0     0    19.0
2 16 MG        72    .130   12.64   1395  12.848    8029      49     164    289   .077     3.7      13   22.3    28    16.0
3 10 MG        58    .120   12.98   1807  13.163   12202      58     225    556   .147     8.5      33   81.8    49    10.0
4 16 MG        56    .130   12.72   1491  12.910    8029      38     163    308   .077     2.9      13   23.7    28    16.0
5 19 MG        46    .120   12.92    848  13.090    6129      23     113    132   .057     1.3       6    7.5    14    19.0
6 16 MG        46    .130   12.68   1499  12.860    8029      31     164    311   .077     2.4      13   23.9    28    16.0
7  3 MG        85    .640   14.17   2747  14.902   19233     118    1669   1177   .113    13.4     189  133.0    88     3.0
8 16 MG        51    .140   12.87   1769  13.065    8029      34     174    361   .077     2.6      13   27.8    28    16.0
9 C.T.       1998    .350    6.64    107   9.148    1769     417     137      7   .143    59.7      20    1.0     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.7      16   12.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.8      14   11.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     3.8      16   12.0
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(     3.8) + 0.65(     3.8) =    3.776   GM/BHP HR
                                  CO- NDIR 0.35(    14.3) + 0.65(    16.4) =   15.702   GM/BHP HR
                                  NO2-NDIR 0.35(    11.5) + 0.65(    12.0) =   11.847   GM/BHP HR
                                                    CORRECTED NO2 =   10.846   GM/BHP HR
                                                             BSFC =     .620   LB/BHP HR


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              CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
MODE         HC-FID    CO     CO2  NO-CL  CARBON   CONS.      HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL   HP     VAC.
----------------------------------------------------------------------------------------------------------
1 IDLE       2349   1.410   10.25     25  11.895    1769      35     424      1   .232     8.1      98     .3     0    19.0
2 16 MG      1161    .120   12.42   1108  12.656    8029      74     154    233   .077     5.7      12   18.0    28    16.0
3 10 MG       739    .110   12.79   1482  12.974   12202      69     209    463   .147    10.2      31   68.0    49    10.0
4 16 MG       827    .120   12.56   1233  12.763    8029      52     152    258   .077     4.0      12   19.8    28    16.0
5 19 MG       470    .120   12.66    546  12.827    6129      22     116     87   .057     1.3       7    4.9    14    19.0
6 16 MG       782    .120   12.55   1175  12.748    8029      49     153    246   .077     3.8      12   18.9    28    16.0
7  3 MG      1590    .570   14.08   2750  14.809   19233     206    1495   1186   .113    23.3     169  134.0    88     3.0
8 16 MG       898    .140   13.05   1971  13.280    8029      54     171    396   .077     4.2      13   30.5    28    16.0
9 C.T.      25570    .370    6.70    112   9.627    1769     470     137      7   .143    67.2      20    1.0     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.8      14   11.1
1 IDLE       2349   1.410   10.25     25  11.895    1769      35     424      1   .232     8.1      98     .3     0    19.0
2 16 MG      1118    .130   12.59   1300  12.832    8029      70     164    270   .077     5.4      13   20.8    28    16.0
3 10 MG       808    .120   13.03   1850  13.231   12202      74     224    566   .147    10.9      33   83.2    49    10.0
4 16 MG       851    .130   12.78   1562  12.995    8029      53     162    320   .077     4.0      12   24.7    28    16.0
5 19 MG       538    .120   12.93    725  13.104    6129      25     113    112   .057     1.4       6    6.4    14    19.0
6 16 MG       806    .120   12.79   1500  12.991    8029      50     150    309   .077     3.8      12   23.8    28    16.0
7  3 MG      1728    .600   14.17   2800  14.943   19233     222    1560   1196   .113    25.1     176  135.2    88     3.0
8 16 MG       762    .140   12.88   1862  13.096    8029      47     173    379   .077     3.6      13   29.2    28    16.0
9 C.T.      23055    .360    6.92    106   9.585    1769     425     134      6   .143    60.8      19     .9     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.7      14   12.2
1 IDLE       2664   2.000   10.99     50  13.257    1769      36     539      2   .232     8.3     125     .5     0    19.0
2 16 MG      1096    .130   12.64   1256  12.880    8029      68     164    260   .077     5.3      13   20.0    28    16.0
3 10 MG       763    .120   13.11   1925  13.306   12202      70     222    586   .147    10.5      33   86.2    49    10.0
4 16 MG       828    .130   12.74   1575  12.952    8029      51     163    324   .077     4.0      13   25.0    28    16.0
5 19 MG       538    .120   12.99    781  13.164    6129      25     113    121   .057     1.4       6    6.9    14    19.0
6 16 MG       829    .130   12.87   1662  13.083    8029      51     161    339   .077     3.9      12   26.1    28    16.0
7  3 MG      1809    .720   14.19   2800  15.091   19233     231    1860   1189   .113    26.1     210  134.3    88     3.0
8 16 MG       784    .140   12.86   1800  13.078    8029      48     174    367   .077     3.7      13   28.2    28    16.0
9 C.T.      23867    .350    6.73    108   9.467    1769     446     132      7   .143    63.8      19    1.0     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.8      17   12.4
1 IDLE       2666   2.000   10.99     50  13.257    1769      36     539      2   .232     8.3     125     .5     0    19.0
2 16 MG      1073    .130   12.64   1406  12.877    8029      67     164    291   .077     5.2      13   22.4    28    16.0
3 10 MG       762    .120   12.98   1843  13.176   12202      71     224    567   .147    10.4      33   83.3    49    10.0
4 16 MG      1720    .130   12.72    720  13.022    8029     106     162    147   .077     8.2      12   11.3    28    16.0
5 19 MG       560    .120   12.92    875  13.096    6129      26     113    136   .057     1.5       6    7.7    14    19.0
6 16 MG       805    .130   12.68   1562  12.891    8029      50     164    323   .077     3.9      13   24.9    28    16.0
7  3 MG      1774    .640   14.17   2900  14.987   19233     228    1659   1236   .113    25.7     187  139.6    88     3.0
8 16 MG       381    .140   12.87   1937  13.048    8029      23     174    396   .077     1.8      13   30.5    28    16.0
9 C.T.      23422    .350    6.64    115   9.332    1769     444     134      7   .143    63.5      19    1.0     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.8      16   12.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.7      14   11.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.8      16   12.2
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(     4.7) + 0.65(     4.8) =    4.783   GM/BHP HR
                                  CO- NDIR 0.35(    14.3) + 0.65(    16.3) =   15.606   GM/BHP HR
                                  NO2-CL   0.35(    11.7) + 0.65(    12.2) =   12.050   GM/BHP HR
                                                    CORRECTED NO2 =   11.032   GM/BHP HR
                                                             BSFC =     .620   LB/BHP HR
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                         TABLE C-5.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-90  TEST-13  RUN-2   1972 STANDARD ENGINE  05-03-73       K = .869      HUM = 41.9  GR/LB
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                CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE            HC      CO     CO2      NO    CARBON    CONS.      HC      CO     NO2     FACT.    HC        CO     NO2     HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE         141   1.490   10.15      69    11.742     1769      23     452       3     .232
2 16 MG         71    .160   12.16    1021    12.347     8029      50     209     220     .077     5.3      105      .8      0     19.0
3 10 MG         50    .160   12.47    1512    12.684    12202      52     311     483     .147     3.8       16    16.9     28     16.0
4 16 MG         50    .170   12.25    1238    12.474     8029      35     221     265     .077     7.6       46    71.0     44     10.0
5 19 MG         40    .160   12.32     621    12.523     6124      21     158     101     .057     2.7       17    20.4     28     16.0
6 16 MG         48    .160   12.24    1267    12.452     8029      33     208     271     .077     1.2        9     5.7     14     19.0
7  3 MG         85    .720   13.67    2721    14.482    19233     122    1932    1200     .113     2.6       16    20.9     28     16.0
8 16 MG         47    .180   12.55    1703    12.781     8029      32     228     355     .077    13.8      218   135.6     88      3.0
9 C.T.        2089    .390    6.69     131     9.335     1769     427     149       8     .143     2.5       18    27.3     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    61.1       21     1.2      0     25.0
1 IDLE         141   1.490   10.15      69    11.742     1769      23     452       3     .232     3.8       18    11.3
2 16 MG         70    .180   12.32    1358    12.576     8029      48     232     288     .077     5.3      105      .8      0     19.0
3 10 MG         52    .170   12.71    1804    12.936    12202      53     324     565     .147     3.7       18    22.2     28     16.0
4 16 MG         51    .180   12.37    1513    12.605     8029      35     232     320     .077     7.8       48    83.0     44     10.0
5 19 MG         42    .170   12.55     721    12.765     6124      22     165     115     .057     2.7       18    24.6     28     16.0
6 16 MG         50    .170   12.46    1550    12.684     8029      34     217     326     .077     1.2        9     6.5     14     19.0
7  3 MG         87    .750   13.76    2720    14.604    19233     124    1995    1189     .113     2.6       17    25.1     28     16.0
8 16 MG         41    .170   12.49    1720    12.704     8029      28     217     361     .077    14.0      225   134.4     88      3.0
9 C.T.        2045    .430    6.89     136     9.524     1769     410     161       8     .143     2.2       17    27.8     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    58.6       23     1.2      0     26.0
1 IDLE         158   2.260   10.86     131    13.291     1769      23     608       6     .232     3.7       18    12.3
2 16 MG         70    .230   12.40    1460    12.706     8029      48     294     306     .077     5.3      141     1.3      0     19.0
3 10 MG         50    .150   12.64    1816    12.844    12202      51     288     573     .147     3.7       23    23.6     28     16.0
4 16 MG         48    .150   12.38    1572    12.592     8029      33     206     333     .077     7.5       42    84.2     44     10.0
5 19 MG         40    .170   12.49     883    12.703     6124      21     166     141     .057     2.5       16    25.6     28     16.0
6 16 MG         54    .260   12.56    1542    12.878     8029      36     327     319     .077     1.2        9     8.1     14     19.0
7  3 MG         74    .860   13.72    2828    14.665    19233     112    2278    1231     .113     2.8       25    24.6     28     16.0
8 16 MG         53    .180   12.28    1713    12.517     8029      37     233     365     .077    12.6      257   139.1     88      3.0
9 C.T.        2142    .380    6.56     120     9.253     1769     442     147       8     .143     2.8       18    28.1     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    63.2       21     1.1      0     25.0
1 IDLE         158   2.260   10.86     131    13.291     1769      23     608       6     .232     3.8       21    12.7
2 16 MG         62    .170   12.32    1472    12.557     8029      43     220     312     .077     5.3      141     1.3      0     19.0
3 10 MG         47    .160   12.69    1872    12.901    12202      48     306     588     .147     3.3       17    24.1     28     16.0
4 16 MG         47    .180   12.48    1697    12.711     8029      32     230     356     .077     7.1       45    86.4     44     10.0
5 19 MG         36    .170   12.59     922    12.799     6124      19     164     146     .057     2.5       18    27.4     28     16.0
6 16 MG         45    .230   12.51    1558    12.789     8029      31     292     325     .077     1.1        9     8.3     14     19.0
7  3 MG         83    .830   13.74    2820    14.660    19233     118    2200    1228     .113     2.3       22    25.0     28     16.0
8 16 MG         43    .190   12.44    1693    12.676     8029      29     243     356     .077    13.3      249   138.8     88      3.0
9 C.T.        2264    .410    6.44     132     9.295     1769     465     158       8     .143     2.3       19    27.4     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    66.5       23     1.2      0     25.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     3.9       20    12.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     3.7       18    11.8
FOUR CYCLE COMPOSITE -                                                                            3.9       21    12.7
                                  HC- NDIR 0.35(     3.7) + 0.65(     3.9) =     3.828    GM/BHP HR
                                  CO- NDIR 0.35(    17.8) + 0.65(    20.6) =    19.657    GM/BHP HR
                                  NO2-NDIR 0.35(    11.8) + 0.65(    12.7) =    12.408    GM/BHP HR
                                                         CORRECTED NO2 =    10.785    GM/BHP HR
                                                                  BSFC =      .620    LB/BHP HR
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                CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL    CARBON    CONS.      HC      CO     NO2     FACT.  HC-FID       CO  NO2-CL     HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        2481   1.490   10.15      38    11.888     1769      37     448       2     .232
2 16 MG       1025    .160   12.16    1025    12.422     8029      66     209     220     .077     8.6      104      .4      0     19.0
3 10 MG        715    .160   12.47    1512    12.701    12202      69     310     482     .147     5.1       16    16.9     28     16.0
4 16 MG        758    .170   12.25    1225    12.496     8029      49     221     261     .077    10.1       46    70.9     44     10.0
5 19 MG        446    .160   12.32     596    12.525     6124      22     158      97     .057     3.8       17    20.1     28     16.0
6 16 MG        713    .160   12.24    1250    12.471     8029      46     208     267     .077     1.2        9     5.5     14     19.0
7  3 MG       1633    .720   13.67    2750    14.553    19233     216    1922    1207     .113     3.5       16    20.6     28     16.0
8 16 MG        760    .180   12.55    1708    12.806     8029      48     228     356     .077    24.4      217   136.3     88      3.0
9 C.T.       25891    .390    6.69      34     9.669     1769     474     144       2     .143     3.7       18    27.4     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    67.7       21      .3      0     25.0
1 IDLE        2481   1.490   10.15      38    11.888     1769      37     448       2     .232     4.8       17    11.3
2 16 MG        937    .180   12.32    1352    12.594     8029      60     232     286     .077     8.6      104      .4      0     19.0
3 10 MG        671    .170   12.71    1825    12.947    12202      63     324     571     .147     4.6       18    22.0     28     16.0
4 16 MG        754    .180   12.37    1508    12.626     8029      48     231     318     .077     9.3       48    83.9     44     10.0
5 19 MG        447    .170   12.55     675    12.765     6124      21     165     108     .057     3.7       18    24.5     28     16.0
6 16 MG        759    .170   12.46    1550    12.706     8029      48     217     325     .077     1.2        9     6.1     14     19.0
7  3 MG       1633    .750   13.76    2750    14.673    19233     214    1986    1197     .113     3.7       17    25.0     28     16.0
8 16 MG        670    .170   12.49    1671    12.727     8029      42     217     350     .077    24.2      224   135.2     88      3.0
9 C.T.       26800    .430    6.89      38    10.000     1769     474     154       2     .143     3.3       17    26.9     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    67.8       22      .3      0     26.0
1 IDLE        2736   2.260   10.86      50    13.394     1769      36     603       2     .232     4.8       18    12.2
2 16 MG       1072    .230   12.40    1450    12.737     8029      68     293     303     .077     8.4      140      .5      0     19.0
3 10 MG        671    .150   12.64    1812    12.857    12202      64     288     571     .147     5.2       23    23.4     28     16.0
4 16 MG        714    .160   12.38    1512    12.611     8029      45     206     320     .077     9.4       42    83.9     44     10.0
5 19 MG        536    .170   12.49     850    12.714     6124      26     165     136     .057     3.5       16    24.6     28     16.0
6 16 MG        761    .260   12.56    1529    12.896     8029      47     327     316     .077     1.5        9     7.7     14     19.0
7  3 MG       1634    .860   13.72    2900    14.743    19233     213    2266    1256     .113     3.6       25    24.3     28     16.0
8 16 MG        684    .180   12.28    1683    12.528     8029      44     233     358     .077    24.1      256   141.9     88      3.0
9 C.T.       26605    .380    6.56      36     9.600     1769     490     141       2     .143     3.4       18    27.6     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    70.1       20      .3      0     25.0
1 IDLE        2736   2.260   10.86      50    13.394     1769      36     603       2     .232     4.9       21    12.6
2 16 MG       1026    .170   12.32    1416    12.593     8029      65     219     300     .077     8.4      140      .5      0     19.0
3 10 MG        716    .160   12.69    1850    12.922    12202      68     305     580     .147     5.0       17    23.1     28     16.0
4 16 MG        760    .180   12.48    1872    12.736     8029      48     229     392     .077     9.9       45    85.3     44     10.0
5 19 MG        492    .170   12.59     870    12.809     6124      24     164     138     .057     3.7       18    30.2     28     16.0
6 16 MG        715    .230   12.51    1550    12.812     8029      45     291     323     .077     1.3        9     7.9     14     19.0
7  3 MG       1644    .830   13.74    2900    14.735    19233     215    2188    1257     .113     3.5       22    24.8     28     16.0
8 16 MG        625    .190   12.44    1642    12.693     8029      40     243     355     .077    24.3      247   142.0     88      3.0
9 C.T.       27222    .410    6.44      38     9.572     1769     503     153       2     .143     3.0       19    27.4     28     16.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    71.9       22      .3      0     25.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     4.9       20    12.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     4.8       18    11.7
FOUR CYCLE COMPOSITE -                                                                            4.9       21    12.7
                                  HC- FID  0.35(     4.8) + 0.65(     4.9) =     4.869    GM/BHP HR
                                  CO- NDIR 0.35(    17.7) + 0.65(    20.5) =    19.536    GM/BHP HR
                                  NO2-CL   0.35(    11.7) + 0.65(    12.7) =    12.393    GM/BHP HR
                                                         CORRECTED NO2 =    10.772    GM/BHP HR
                                                                  BSFC =      .620    LB/BHP HR
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                 TABLE C-6.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-00  TEST-13  RUN-3   1972 STANDARD ENGINE  05-03-73      K = .904      HUM = 49.6  GR/LB
-------------------------------------------------------------------------------------------------------------------------
MODE            CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
                 HC      CO     CO2      NO    CARBON   CONS.      HC      CO     NO2   FACT.    HC        CO     NO2   HP   VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE           123   1.350   10.21      80   11.693    1769      20     413       4   .232     4.7       96      .9    0   19.0
2 16 MG           75    .150   12.72    1389   12.951    8029      50     188     286   .077     3.9       14    22.0   28   16.0
3 10 MG           56    .120   13.14    1967   13.320   12202      55     222     598   .147     8.1       33    87.9   44   10.0
4 16 MG           51    .120   12.86    1707   13.035    8029      34     149     349   .077     2.6       11    26.9   28   16.0
5 19 MG           39    .120   13.00     767   13.162    6129      20     113     118   .057     1.1        6     6.8   14   19.0
6 16 MG           51    .120   12.86    1728   13.035    8029      34     149     353   .077     2.6       11    27.2   28   16.0
7  3 MG           98    .910   14.03    2628   15.046   19233     135    2350    1115   .113    15.3      266   126.0   88    3.0
8 16 MG           47    .140   13.00    1834   13.191    8029      31     172     371   .077     2.4       13    28.5   28   16.0
9 C.T.          2117    .270    7.34     150    9.896    1769     409      97       9   .143    58.4       14     1.3    0   25.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.7       18    12.4
1 IDLE           123   1.350   10.21      80   11.693    1769      20     413       4   .232     4.7       96      .9    0   19.0
2 16 MG           65    .130   12.72    1408   12.920    8029      44     163     290   .077     3.4       13    22.4   28   16.0
3 10 MG           51    .110   13.00    1967   13.165   12202      51     206     605   .147     7.5       30    89.0   44   10.0
4 16 MG           42    .120   12.86    1687   13.025    8029      28     149     345   .077     2.2       12    26.6   28   16.0
5 19 MG           37    .120   13.00     814   13.160    6129      19     113     126   .057     1.1        6     7.2   14   19.0
6 16 MG           42    .130   12.72    1524   12.895    8029      28     164     315   .077     2.2       13    24.3   28   16.0
7  3 MG           89    .740   14.03    2819   14.866   19233     124    1934    1211   .113    14.1      219   136.8   88    3.0
8 16 MG           47    .130   12.86    1645   13.041    8029      31     162     336   .077     2.4       12    25.9   28   16.0
9 C.T.          1920    .300    6.94     151    9.322    1769     395     115      10   .143    56.5       16     1.4    0   25.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.5       16    12.6
1 IDLE           980   1.160   11.41      98   13.628    1769     137     304       4   .232    31.9       71     1.0    0   19.0
2 16 MG           68    .130   12.59    1351   12.793    8029      46     165     281   .077     3.5       13    21.7   28   16.0
3 10 MG           51    .120   13.00    1967   13.175   12202      51     224     605   .147     7.5       33    88.9   44   10.0
4 16 MG           47    .130   12.72    1605   12.901    8029      32     163     332   .077     2.4       13    25.5   28   16.0
5 19 MG           37    .120   12.86     846   13.020    6129      19     114     132   .057     1.1        6     7.5   14   19.0
6 16 MG           47    .130   12.72    1584   12.901    8029      32     163     327   .077     2.4       13    25.2   28   16.0
7  3 MG           94    .690   14.03    2875   14.822   19233     132    1809    1239   .113    14.9      204   140.0   88    3.0
8 16 MG           37    .140   12.72    1707   12.900    8029      25     176     353   .077     1.9       14    27.2   28   16.0
9 C.T.          2135    .300    6.68     150    9.286    1769     439     115       9   .143    62.8       17     1.4    0   25.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.8       14    12.8
1 IDLE           122   1.160   11.41      98   12.702    1769      18     326       5   .232     4.3       76     1.1    0   19.0
2 16 MG           65    .130   12.54    1408   12.740    8029      44     165     293   .077     3.4       13    22.6   28   16.0
3 10 MG           51    .120   13.00    1857   13.175   12202      51     224     571   .147     7.5       33    83.9   44   10.0
4 16 MG           51    .130   12.72    1625   12.905    8029      34     163     336   .077     2.6       13    25.8   28   16.0
5 19 MG           42    .120   12.86     767   13.025    6129      21     114     120   .057     1.2        6     6.8   14   19.0
6 16 MG           47    .120   12.72    1544   12.891    8029      32     151     319   .077     2.4       12    24.6   28   16.0
7  3 MG           89    .710   14.03    2791   14.836   19233     125    1859    1201   .113    14.1      210   135.7   88    3.0
8 16 MG           47    .130   12.86    1687   13.041    8029      31     162     345   .077     2.4       12    26.6   28   16.0
9 C.T.          2152    .300    6.81     172    9.434    1769     436     114      11   .143    62.3       16     1.5    0   25.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.8       15    12.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.6       17    12.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.3       15    12.6
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(     3.6) + 0.65(     4.3) =    4.077   GM/BHP HR
                                    CO- NDIR 0.35(    16.6) + 0.65(    14.6) =   15.299   GM/BHP HR
                                    NO2-NDIR 0.35(    12.5) + 0.65(    12.6) =   12.592   GM/BHP HR
                                                          CORRECTED NO2 =   11.335   GM/BHP HR
                                                                   BSFC =     .620   LB/BHP HR
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MODE            CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR            MAN.
               HC-FID    CO     CO2   NO-CL    CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID      CO  NO2-CL   HP   VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE          2269   1.350   10.21      38   11.787    1769      34     409       2   .232     7.9       95      .4    0   19.0
2 16 MG         1343    .150   12.72    1363   13.004    8029      83     187     279   .077     6.4       14    21.5   28   16.0
3 10 MG          898    .120   13.14    1963   13.350   12202      82     222     596   .147    12.1       33    87.6   44   10.0
4 16 MG          896    .120   12.86    1700   13.070    8029      55     149     347   .077     4.2       11    26.7   28   16.0
5 19 MG          583    .120   13.00     750   13.178    6129      27     113     116   .057     1.5        6     6.6   14   19.0
6 16 MG          806    .120   12.86    1700   13.061    8029      50     149     347   .077     3.8       11    26.7   28   16.0
7  3 MG         2003    .910   14.03    2600   15.140   19233     254    2335    1097   .113    28.8      264   123.9   88    3.0
8 16 MG          673    .140   13.00    1800   13.207    8029      41     172     363   .077     3.1       13    28.0   28   16.0
9 C.T.         23997    .270    7.34      40   10.010    1769     424      96       2   .143    60.6       14      .3    0   25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------      4.8       17    12.1
1 IDLE          2269   1.350   10.21      38   11.787    1769      34     409       2   .232     7.9       95      .4    0   19.0
2 16 MG         1029    .130   12.72    1412   12.953    8029      64     163     291   .077     4.9       13    22.4   28   16.0
3 10 MG          718    .110   13.00    1963   13.182   12202      66     206     603   .147     9.8       30    88.7   44   10.0
4 16 MG          717    .120   12.86    1683   13.052    8029      44     149     344   .077     3.4       11    26.5   28   16.0
5 19 MG          493    .120   13.00     788   13.169    6129      23     113     122   .057     1.3        6     6.9   14   19.0
6 16 MG          671    .130   12.72    1513   12.917    8029      42     163     312   .077     3.2       13    24.0   28   16.0
7  3 MG         1819    .740   14.03    2850   14.952   19233     234    1923    1217   .113    26.4      217   137.5   88    3.0
8 16 MG          650    .130   12.86    1649   13.055    8029      40     162     337   .077     3.1       12    25.9   28   16.0
9 C.T.         23870    .300    6.94      93    9.627    1769     439     111       6   .143    62.7       16      .8    0   25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------      4.6       16    12.6
1 IDLE          2143   1.160   11.41      50   12.784    1769      30     324       2   .232     6.9       75      .5    0   19.0
2 16 MG         1028    .130   12.59    1350   12.823    8029      64     164     281   .077     5.0       13    21.6   28   16.0
3 10 MG          718    .120   13.00    1958   13.192   12202      66     224     601   .147     9.8       33    88.4   44   10.0
4 16 MG          738    .130   12.72    1596   12.924    8029      46     163     329   .077     3.5       13    25.3   28   16.0
5 19 MG          538    .120   12.86     825   13.034    6129      25     114     129   .057     1.4        6     7.3   14   19.0
6 16 MG          714    .130   12.72    1575   12.922    8029      44     163     325   .077     3.4       13    25.0   28   16.0
7  3 MG         1863    .690   14.03    2900   14.906   19233     240    1798    1242   .113    27.2      203   140.4   88    3.0
8 16 MG          716    .140   12.72    1700   12.932    8029      44     176     350   .077     3.4       14    27.0   28   16.0
9 C.T.         26421    .300    6.68      78    9.622    1769     486     111       5   .143    69.5       16      .7    0   25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------      4.9       15    12.7
1 IDLE          2143   1.160   11.41      50   12.784    1769      30     324       2   .232     6.9       75      .5    0   19.0
2 16 MG          984    .130   12.59    1425   12.818    8029      62     164     296   .077     4.7       13    22.8   28   16.0
3 10 MG          718    .120   13.00    1913   13.192   12202      66     224     587   .147     9.8       33    86.4   44   10.0
4 16 MG          716    .130   12.72    1650   12.922    8029      44     163     340   .077     3.4       13    26.2   28   16.0
5 19 MG          493    .120   12.86     763   13.029    6129      23     114     119   .057     1.3        6     6.8   14   19.0
6 16 MG          716    .120   12.72    1600   12.912    8029      45     151     330   .077     3.4       12    25.4   28   16.0
7  3 MG         1727    .710   14.03    2800   14.913   19233     223    1850    1199   .113    25.2      209   135.5   88    3.0
8 16 MG          627    .130   12.86    1761   13.053    8029      39     162     360   .077     3.0       12    27.7   28   16.0
9 C.T.         22535    .300    6.81     116    9.363    1769     426     114       7   .143    60.9       16     1.0    0   25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------      4.5       15    12.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------      4.7       17    12.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------      4.7       15    12.6
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(     4.7) + 0.65(     4.7) =    4.708   GM/BHP HR
                                    CO- NDIR 0.35(    16.5) + 0.65(    14.6) =   15.272   GM/BHP HR
                                    NO2-CL   0.35(    12.3) + 0.65(    12.6) =   12.516   GM/BHP HR
                                                          CORRECTED NO2 =   11.312   GM/BHP HR
                                                                   BSFC =     .620   LB/BHP HR
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                    TABLE C-7.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-00  TEST-13  RUN-4   1972 STANDARD ENGINE  05-09-73      K = .942      HUM = 58.8  GR/LB
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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR              MAN.
MODE         HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2     FACT.    HC       CO    NO2     HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE       131   1.380  10.53    102   12.051    1729      20     399       5     .232     4.7      93    1.1      0   19.0
2 16 MG       67    .150  12.47   1298   12.692    8029      46     192     273     .077     3.5      15   21.0     28   16.0
3 10 MG       45    .150  12.63   1385   12.829   12202      46     288     437     .147     6.8      42   64.2     49   10.0
4 16 MG       46    .150  12.40   1219   12.600    8029      32     193     257     .077     2.4      15   19.8     28   16.0
5 19 MG       35    .150  12.58    587   12.768    6129      18     145      93     .057     1.0       8    5.3     19   19.0
6 16 MG       44    .180  12.55   1223   12.778    8029      30     228     255     .077     2.3      18   19.6     28   16.0
7  3 MG       77    .580  14.09   2657   14.753   19233     108    1527    1150     .113    12.3     173  129.9     88    3.0
8 16 MG       39    .160  12.63   1600   12.832    8029      26     202     332     .077     2.0      16   25.6     28   16.0
9 C.T.      2136    .350   6.59     80    9.247    1769     441     135       5     .143    63.1      19     .7      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.7      16   10.8
1 IDLE       131   1.380  10.53    102   12.051    1729      20     399       5     .232     4.7      93    1.1      0   19.0
2 16 MG       56    .160  10.53   1183   10.750    8029      45     241     293     .077     3.5      19   22.6     28   16.0
3 10 MG       41    .150  12.76   1571   12.954   12202      42     285     491     .147     6.1      42   72.2     49   10.0
4 16 MG       42    .160  12.62   1386   12.825    8029      28     202     288     .077     2.2      16   22.2     28   16.0
5 19 MG       35    .160  12.79    654   12.988    6129      18     152     102     .057     1.0       9    5.8     19   19.0
6 16 MG       43    .190  12.69   1916   12.926    8029      29     238     292     .077     2.2      18   22.5     28   16.0
7  3 MG       74    .610  14.03   2734   14.720   19233     104    1610    1186     .113    11.8     182  134.0     88    3.0
8 16 MG       39    .170  12.71   1691   12.922    8029      26     213     349     .077     2.0      16   26.9     28   16.0
9 C.T.      2062    .340   6.79    118    9.357    1769     421     130       7     .143    60.2      19    1.1      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.5      16   11.6
1 IDLE       115   1.520  11.18     81   12.824    1729      17     413       4     .232     3.9      96     .8      0   19.0
2 16 MG       58    .170  12.64   1375   12.873    8029      39     214     285     .077     3.0      16   21.9     28   16.0
3 10 MG       44    .150  12.93   1685   13.128   12202      44     282     520     .147     6.5      41   76.4     49   10.0
4 16 MG       43    .170  12.72   1383   12.936    8029      29     213     285     .077     2.2      16   21.9     28   16.0
5 19 MG       35    .160  12.81    630   13.008    6129      18     152      98     .057     1.0       9    5.6     19   19.0
6 16 MG       42    .160  12.62   1319   12.825    8029      28     202     274     .077     2.2      16   21.1     28   16.0
7  3 MG       82    .650  14.05   2647   14.789   19233     115    1708    1165     .113    13.0     193  131.6     88    3.0
8 16 MG       41    .170  12.82   1600   13.034    8029      27     212     327     .077     2.1      16   25.2     28   16.0
9 C.T.      1847    .330   7.10    105    9.425    1769     374     125       7     .143    53.5      18     .9      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.3      16   11.5
1 IDLE       115   1.520  11.18     81   12.824    1729      17     413       4     .232     3.9      96     .8      0   19.0
2 16 MG       59    .170  12.64   1335   12.874    8029      40     214     276     .077     3.1      16   21.3     28   16.0
3 10 MG       46    .150  12.87   1755   13.070   12202      46     283     544     .147     6.8      42   80.0     49   10.0
4 16 MG       46    .160  12.64   1479   12.850    8029      31     202     307     .077     2.4      16   23.6     28   16.0
5 19 MG       38    .160  12.75    729   12.951    6129      19     153     114     .057     1.1       9    6.5     19   19.0
6 16 MG       44    .170  12.59   1441   12.808    8029      30     215     300     .077     2.3      17   23.1     28   16.0
7  3 MG       81    .670  14.03   2683   14.787   19233     114    1760    1159     .113    12.9     199  130.9     88    3.0
8 16 MG       41    .170  12.67   1600   12.884    8029      28     214     331     .077     2.1      16   25.5     28   16.0
9 C.T.      2034    .330   6.76     77    9.287    1769     418     127       5     .143    59.8      18     .7      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.6      16   11.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     3.6      15   11.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     3.4      16   11.7
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(     3.6) + 0.65(     3.4) =     3.495   GM/BHP HR
                                        CO- NDIR 0.35(    15.3) + 0.65(    16.0) =    15.762   GM/BHP HR
                                        NO2-NDIR 0.35(    11.2) + 0.65(    11.7) =    11.506   GM/BHP HR
                                                               CORRECTED NO2 =    10.835   GM/BHP HR
                                                                        BSFC =      .619   LB/BHP HR
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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR              MAN.
MODE       HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2     FACT.  HC-FID     CO  NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE      1965   1.380  10.53     87   12.106    1729      28     397       4     .232     6.5      92    1.0      0   19.0
2 16 MG     1027    .150  12.47   1362   12.723    8029      65     191     285     .077     5.0      15   22.0     28   16.0
3 10 MG      716    .150  12.63   1431   12.852   12202      68     288     451     .147    10.0      42   66.3     49   10.0
4 16 MG      826    .150  12.40   1225   12.633    8029      52     193     258     .077     4.0      15   19.9     28   16.0
5 19 MG      469    .150  12.58    581   12.777    6129      23     145      92     .057     1.3       8    5.3     19   19.0
6 16 MG      715    .180  12.55   1225   12.802    8029      45     228     255     .077     3.5      18   19.6     28   16.0
7  3 MG     1545    .580  14.09   2700   14.824   19233     200    1520    1163     .113    22.6     172  131.4     88    3.0
8 16 MG      738    .160  12.63   1579   12.864    8029      46     202     326     .077     3.5      16   25.1     28   16.0
9 C.T.     24026    .350   6.59     75    9.343    1769     455     134       5     .143    65.1      19     .7      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     4.6      15   11.0
1 IDLE      1965   1.380  10.53     87   12.106    1729      28     397       4     .232     6.5      92    1.0      0   19.0
2 16 MG      879    .160  10.53   1212   10.779    8029      65     241     300     .077     5.0      19   23.1     28   16.0
3 10 MG      604    .150  12.76   1562   12.970   12202      57     285     488     .147     8.4      42   71.7     49   10.0
4 16 MG      643    .160  12.62   1375   12.844    8029      43     202     285     .077     3.3      16   22.0     28   16.0
5 19 MG      448    .160  12.79    650   12.995    6129      21     152     102     .057     1.2       9    5.8     19   19.0
6 16 MG      716    .190  12.69   1350   12.952    8029      44     238     278     .077     3.4      18   21.4     28   16.0
7  3 MG     1465    .610  14.03   2700   14.786   19233     191    1603    1166     .113    21.5     181  131.8     88    3.0
8 16 MG      649    .170  12.71   1700   12.945    8029      40     213     350     .077     3.1      16   27.0     28   16.0
9 C.T.     23239    .340   6.79     79    9.454    1769     435     129       5     .143    62.2      18     .7      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     4.3      15   11.5
1 IDLE      2056   1.520  11.18     50   12.906    1729      27     410       2     .232     6.4      95     .5      0   19.0
2 16 MG      973    .170  12.64   1370   12.907    8029      61     214     283     .077     4.7      16   21.8     28   16.0
3 10 MG      628    .150  12.93   1725   13.143   12202      58     281     532     .147     8.6      41   78.2     49   10.0
4 16 MG      672    .170  12.72   1375   12.957    8029      42     213     283     .077     3.2      16   21.8     28   16.0
5 19 MG      448    .160  12.81    637   13.015    6129      21     152     100     .057     1.2       9    5.7     19   19.0
6 16 MG      626    .160  12.62   1925   12.843    8029      39     202     296     .077     3.0      16   22.8     28   16.0
7  3 MG     1569    .650  14.05   2650   14.857   19233     203    1700    1139     .113    22.9     192  128.7     88    3.0
8 16 MG      627    .170  12.82   1575   13.053    8029      39     211     322     .077     3.0      16   24.8     28   16.0
9 C.T.     21376    .330   7.10     84    9.567    1769     395     123       5     .143    56.5      18     .7      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     4.1      16   11.5
1 IDLE      2056   1.520  11.18     50   12.906    1729      27     410       2     .232     6.4      95     .5      0   19.0
2 16 MG      917    .170  12.64   1337   12.902    8029      57     214     276     .077     4.4      16   21.3     28   16.0
3 10 MG      627    .150  12.87   1775   13.083   12202      59     283     550     .147     8.6      42   80.8     49   10.0
4 16 MG      671    .160  12.64   1900   12.867    8029      42     202     290     .077     3.2      16   22.3     28   16.0
5 19 MG      493    .160  12.75    725   12.959    6129      23     153     114     .057     1.3       9    6.5     19   19.0
6 16 MG      716    .170  12.59   1475   12.832    8029      45     215     306     .077     3.4      17   23.6     28   16.0
7  3 MG     1545    .670  14.03   2750   14.854   19233     200    1752    1182     .113    22.6     198  133.6     88    3.0
8 16 MG      582    .170  12.67   1612   12.898    8029      36     214     333     .077     2.8      16   25.7     28   16.0
9 C.T.     22590    .330   6.76     90    9.349    1769     427     126       6     .143    61.1      18     .8      0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     4.3      16   11.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     4.5      15   11.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     4.2      16   11.7
FOUR CYCLE COMPOSITE =                  HC= FID  0.35(     4.5) + 0.65(     4.2) =     4.295   GM/BHP HR
                                        CO= NDIR 0.35(    15.2) + 0.65(    16.0) =    15.695   GM/BHP HR
                                        NO2=CL   0.35(    11.2) + 0.65(    11.7) =    11.528   GM/BHP HR
                                                               CORRECTED NO2 =    10.856   GM/BHP HR
                                                                        BSFC =      .619   LB/BHP HR
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                    TABLE C-8.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-U   TEST 15  RUN-1   1973 STANDARD ENGINE  05-07-73     K = .920     HUM = 53.5  GR/LB
--------------------------------------------------------------------------------------------------------------
            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE        HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2   FACT.   HC        CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE      79    .200   10.60     85   10.885    1633     13      61       4   .232    3.0       14    1.0     0   18.5
2 16 HG     47    .150   13.10    679   13.301    8210     31     187     138   .077    2.4       14   10.6    23   16.0
3 10 HG     42    .150   13.43   1427   13.625   12973     43     288     451   .147    6.3       42   66.3    44   10.0
4 16 HG     25    .120   13.00    736   13.147    8210     17     151     153   .077    1.3       12   11.7    23   16.0
5 19 HG     19    .090   12.86    331   12.971    6124     10      86      52   .057     .6        5    3.0    10   19.0
6 16 HG     23    .120   12.86    674   13.005    8210     16     153     141   .077    1.2       12   10.9    23   16.0
7  3 HG     84   1.330   13.73   1831   15.151   19822    119    3514     795   .113   13.4      397   89.9    84    3.0
8 16 HG     23    .120   13.14    751   13.285    8210     15     150     154   .077    1.2       12   11.9    23   16.0
9 C.T.    1687    .220    7.66     97    9.702    1678    315      77       6   .143   45.1       11     .8     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.1       21    8.5
1 IDLE      79    .200   10.60     85   10.885    1633     13      61       4   .232    3.0       14    1.0     0   18.5
2 16 HG     56    .130   13.00    690   13.190    8210     38     163     143   .077    2.9       13   11.0    23   16.0
3 10 HG     47    .200   13.73   1544   13.981   12973     47     375     476   .147    6.9       55   69.9    44   10.0
4 16 HG     28    .120   13.00    736   13.150    8210     19     151     153   .077    1.5       12   11.7    23   16.0
5 19 HG     25    .090   13.00    399   13.117    6124     13      85      62   .057     .7        5    3.5    10   19.0
6 16 HG     28    .120   13.14    736   13.290    8210     19     150     151   .077    1.4       12   11.6    23   16.0
7  3 HG     94   1.550   13.73   1728   15.382   19822    131    4035     739   .113   14.8      456   83.5    85    3.0
8 16 HG     28    .120   13.43    978   13.580    8210     18     147     196   .077    1.4       11   15.1    23   16.0
9 C.T.    1756    .200    7.77    114    9.866    1678    323      69       6   .143   46.1       10     .9     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.2       24    8.6
1 IDLE     108    .450   11.53    123   12.097    1633     16     123       6   .232    3.7       28    1.3     0   18.5
2 16 HG     42    .130   13.29    863   13.465    8210     28     160     175   .077    2.1       12   13.5    23   16.0
3 10 HG     42    .220   13.73   1624   13.995   12973     42     412     500   .147    6.2       61   73.5    44   10.0
4 16 HG     29    .130   13.43    928   13.591    8210     19     159     186   .077    1.5       12   14.3    23   16.0
5 19 HG     23    .100   13.43    427   13.555    6124     11      91      64   .057     .6        5    3.7    10   19.0
6 16 HG     28    .140   13.35    944   13.520    8210     18     172     190   .077    1.4       13   14.7    23   16.0
7  3 HG     94   1.570   13.58   1707   15.252   19822    132    4122     787   .113   14.9      466   88.9    85    3.0
8 16 HG     28    .130   13.42    961   13.580    8210     18     159     193   .077    1.4       12   14.9    23   16.0
9 C.T.    1691    .200    7.74    119    9.712    1678    306      70       7   .143   43.8       10     .9     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.1       26    9.1
1 IDLE     108    .450   11.53    123   12.097    1633     16     123       6   .232    3.7       28    1.3     0   18.5
2 16 HG     47    .150   13.29    944   13.491    8210     31     184     191   .077    2.4       14   14.7    23   16.0
3 10 HG     42    .160   13.58   1624   13.785   12973     43     304     507   .147    6.3       45   74.6    44   10.0
4 16 HG     30    .130   13.43    944   13.592    8210     20     154     189   .077    1.5       12   14.6    23   16.0
5 19 HG     23    .110   13.43    469   13.565    6124     11     100      70   .057     .6        6    4.0    10   19.0
6 16 HG     28    .130   13.43    976   13.590    8210     18     159     196   .077    1.4       12   15.1    23   16.0
7  3 HG     94   1.570   13.58   1728   15.252   19822    132    4122     796   .113   14.9      466   89.9    85    3.0
8 16 HG     28    .130   13.58   1012   13.790    8210     18     157     201   .077    1.4       12   15.5    23   16.0
9 C.T.    1691    .180    7.49    127    9.442    1678    315      65       7   .143   45.0        9    1.1     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.2       25    9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     3.2       23    8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     3.1       25    9.2
FOUR CYCLE COMPOSITE -
                                 HC- NDIR 0.35(     3.2) + 0.65(     3.1) =     3.151   GM/BHP HR
                                 CO- NDIR 0.35(    22.8) + 0.65(    25.2) =    24.381   GM/BHP HR
                                 NO2-NDIR 0.35(     8.5) + 0.65(     9.2) =     8.944   GM/BHP HR
                                                      CORRECTED NO2 =     8.236   GM/BHP HR
                                                               BSFC =      .695   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE      HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE    1452    .200   10.60     38   10.945    1633     22      60       2   .232    5.0       14     .4     0   18.5
2 16 HG    853    .150   13.10    625   13.335    8210     53     187     128   .077    4.0       14    9.8    24   16.0
3 10 HG    446    .150   13.43   1375   13.675   12973     90     287     433   .147   13.2       42   63.7    44   10.0
4 16 HG    673    .120   13.00    675   13.187    8210     42     151     140   .077    3.2       12   10.7    23   16.0
5 19 HG    403    .090   12.86    300   12.990    6124     19      86      47   .057    1.1        5    2.7    10   19.0
6 16 HG    582    .120   12.86    625   13.038    8210     37     153     131   .077    2.8       12   10.1    23   16.0
7  3 HG   2324   1.330   13.73   1725   15.292   19822    301    3482     742   .113   34.0      394   83.9    85    3.0
8 16 HG    444    .120   13.14    700   13.305    8210     28     150     143   .077    2.1       12   11.0    24   16.0
9 C.T.   21019    .220    7.66     71    9.982    1678    353      75       4   .143   50.5       11     .6     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     4.8       21    8.0
1 IDLE    1452    .200   10.60     38   10.945    1633     22      60       2   .232    5.0       14     .4     0   18.5
2 16 HG    650    .130   13.00    638   13.195    8210     40     163     132   .077    3.1       13   10.1    23   16.0
3 10 HG    722    .200   13.73   1488   14.002   12973     67     374     458   .147    9.8       55   67.3    44   10.0
4 16 HG    354    .120   13.00    675   13.156    8210     22     151     140   .077    1.7       12   10.8    24   16.0
5 19 HG    202    .090   13.00    350   13.110    6124      9      85      59   .057     .5        5    3.4    10   19.0
6 16 HG    314    .120   13.14    688   13.291    8210     19     150     141   .077    1.5       12   10.9    23   16.0
7  3 HG   2237   1.550   13.73   1650   15.504   19822    286    4003     700   .113   32.3      452   79.1    85    3.0
8 16 HG    338    .120   13.43    913   13.584    8210     20     197     183   .077    1.6       11   14.1    23   16.0
9 C.T.   20695    .200    7.77     43   10.039    1678    346      68       5   .143   49.5       10     .7     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     4.3       24    8.1
1 IDLE    2266    .450   11.53     50   12.207    1633     30     122       2   .232    7.0       28     .6     0   18.5
2 16 HG    719    .130   13.29    813   13.492    8210     44     160     164   .077    3.4       12   12.6    23   16.0
3 10 HG    835    .220   13.73   1550   14.034   12973     77     411     476   .147   11.4       60   69.9    44   10.0
4 16 HG    450    .130   13.43    887   13.605    8210     27     154     178   .077    2.1       12   13.7    24   16.0
5 19 HG    203    .100   13.43    375   13.550    6124      9      91      56   .057     .5        5    3.2    10   19.0
6 16 HG    450    .140   13.35    887   13.535    8210     27     172     174   .077    2.1       13   13.4    23   16.0
7  3 HG   2296   1.570   13.58   1612   15.375   19822    290    4089     690   .113   32.7      462   78.0    86    3.0
8 16 HG    338    .130   13.42    900   13.584    8210     20     158     181   .077    1.6       12   13.9    23   16.0
9 C.T.   21369    .200    7.74     77   10.077    1678    356      67       4   .143   50.9       10     .6     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     4.6       25    8.5
1 IDLE    2266    .450   11.53     50   12.207    1633     30     122       2   .232    7.0       28     .6     0   18.5
2 16 HG    742    .150   13.29    875   13.514    8210     45     184     176   .077    3.5       14   13.6    23   16.0
3 10 HG    699    .160   13.58   1588   13.810   12973     66     304     495   .147    9.6       45   72.6    44   10.0
4 16 HG    630    .130   13.43    900   13.623    8210     38     158     180   .077    2.9       12   13.9    23   16.0
5 19 HG    203    .110   13.43    412   13.560    6124      9     100      62   .057     .5        6    3.5    10   19.0
6 16 HG    428    .130   13.43    937   13.603    8210     26     154     188   .077    2.0       12   14.5    23   16.0
7  3 HG   2257   1.570   13.58   1675   15.376   19822    291    4088     717   .113   32.9      462   81.0    86    3.0
8 16 HG    316    .130   13.58    950   13.742    8210     19     157     188   .077    1.5       12   14.5    23   16.0
9 C.T.   21468    .180    7.49     77    9.817    1678    367      62       4   .143   52.5        9     .6     0   24.5
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     4.6       25    8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     4.6       23    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     4.6       25    8.7
FOUR CYCLE COMPOSITE -
                                 HC- FID  0.35(     4.6) + 0.65(     4.6) =     4.597   GM/BHP HR
                                 CO- NDIR 0.35(    22.6) + 0.65(    25.1) =    24.199   GM/BHP HR
                                 NO2-CL   0.35(     8.0) + 0.65(     8.7) =     8.451   GM/BHP HR
                                                      CORRECTED NO2 =     7.778   GM/BHP HR
                                                               BSFC =      .695   LB/BHP HR
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TABLE C-9. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 3-0   TEST 15  RUN-2   1973 STANDARD ENGINE  05-07-73      K = .959     HUM = 62.1  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR               MAN.
MODE          HC      CO     CO2     NO    CARBON   CONS.      HC     CO    NO2    FACT.    HC      CO    NO2    HP      VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE        173   .290   10.56     36   11.037    1633      28     87      2    .232    6.4     20     .4     0     18.5
2 16 MG        56   .170   12.86    674   13.090    8210      38    215    140    .077    2.9     17   10.8    23     16.0
3 10 MG        55   .170   13.40   1665   13.629   12973      57    327    526    .147    8.3     48   77.3    49     10.0
4 16 MG        39   .120   12.93    830   13.092    8210      26    152    173    .077    2.0     12   13.3    23     16.0
5 19 MG        32   .090   13.07    376   13.195    6124      16     84     58    .057     .9      5    3.3    10     19.0
6 16 MG        37   .120   13.00    828   13.160    8210      25    151    171    .077    1.9     12   13.2    23     16.0
7  3 MG       105  2.090   13.21   1645   15.413   19822     146   5429    702    .113   16.5    614   79.4    85      3.0
8 16 MG        37   .120   13.21    944   13.370    8210      25    149    192    .077    1.9     11   14.8    23     16.0
9 C.T.       1522   .190    7.30     73    9.134    1678     302     71      4    .143   43.2     10     .6     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   3.5     31    8.8
1 IDLE        173   .290   10.56     36   11.037    1633      28     87      2    .232    6.4     20     .4     0     18.5
2 16 MG        56   .140   13.07    846   13.270    8210      37    175    174    .077    2.9     13   13.4    23     16.0
3 10 MG        57   .260   13.58   1813   13.902   12973      57    490    562    .147    8.4     72   82.6    49     10.0
4 16 MG        38   .120   13.14    961   13.301    8210      25    150    197    .077    2.0     12   15.2    23     16.0
5 19 MG        37   .110   13.07    954   13.220    6124      19    103     70    .057    1.1      6    4.0    10     19.0
6 16 MG        37   .120   13.14    944   13.300    8210      25    150    193    .077    1.9     12   14.9    23     16.0
7  3 MG       105  2.250   13.07   1544   15.433   19822     146   5837    658    .113   16.5    660   74.4    85      3.0
8 16 MG        37   .120   13.21   1002   13.370    8210      25    149    204    .077    1.9     11   15.7    23     16.0
9 C.T.       1542   .190    7.66     84    9.515    1678     294     68      5    .143   42.0     10     .7     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   3.4     34    9.1
1 IDLE        150   .230   11.41     60   11.802    1633      22     64      3    .232    5.2     15     .6     0     18.5
2 16 MG        56   .140   13.14    814   13.340    8210      37    174    166    .077    2.9     13   12.8    23     16.0
3 10 MG        55   .190   13.43   1604   13.679   12973      56    364    505    .147    8.3     54   74.2    49     10.0
4 16 MG        37   .120   13.14    878   13.300    8210      25    150    180    .077    1.9     12   13.9    23     16.0
5 19 MG        37   .110   13.07    969   13.220    6124      19    103     72    .057    1.1      6    4.1    10     19.0
6 16 MG        38   .130   13.21    927   13.381    8210      25    161    189    .077    1.9     12   14.5    23     16.0
7  3 MG       107  2.160   13.14   1504   15.416   19822     149   5610    642    .113   16.8    634   72.6    85      3.0
8 16 MG        38   .120   13.21    895   13.371    8210      25    149    182    .077    1.9     11   14.0    23     16.0
9 C.T.       1580   .210    7.48     70    9.396    1678     305     76      4    .143   43.6     11     .6     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   3.4     32    8.5
1 IDLE        150   .230   11.41     60   11.802    1633      22     64      3    .232    5.2     15     .6     0     18.5
2 16 MG        56   .120   12.86    830   13.040    8210      38    153    173    .077    2.9     12   13.4    23     16.0
3 10 MG        56   .220   13.50   1728   13.780   12973      57    418    590    .147    8.4     61   78.6    49     10.0
4 16 MG        41   .120   13.07    895   13.234    8210      27    150    184    .077    2.1     12   14.2    23     16.0
5 19 MG        37   .090   13.07    371   13.200    6124      19     84     57    .057    1.1      5    3.3    10     19.0
6 16 MG        39   .120   13.07    862   13.232    8210      26    150    178    .077    2.0     12   13.7    23     16.0
7  3 MG       107  2.030   13.07   1584   15.216   19822     151   5342    685    .113   17.0    604   77.4    85      3.0
8 16 MG        37   .120   13.07    977   13.230    8210      25    150    201    .077    1.9     12   15.5    23     16.0
9 C.T.       1660   .200    7.04     90    9.033    1678     333     75      6    .143   47.6     11     .8     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   3.6     31    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------   3.4     32    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------   3.5     31    8.8
FOUR CYCLE COMPOSITE -
                                 HC- NDIR 0.35(     3.4) + 0.65(     3.5) =    3.506   GM/BHP HR
                                 CO- NDIR 0.35(    32.2) + 0.65(    31.1) =   31.504   GM/BHP HR
                                 NO2-NDIR 0.35(     9.0) + 0.65(     8.8) =    8.835   GM/BHP HR
                                                     CORRECTED NO2 =    8.432   GM/BHP HR
                                                              BSFC =     .695   LB/BHP HR
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR                 MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC     CO    NO2    FACT.  HC-FID    CO   NO2-CL   HP      VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE       1981   .290   10.56     37   11.048    1633      29     87      2    .232    6.8     20     .4     0     18.5
2 16 MG       672   .170   12.86    675   13.097    8210      42    215    140    .077    3.2     17   10.8    23     16.0
3 10 MG       743   .170   13.40   1631   13.694   12973      71    327    515    .147   10.4     48   75.7    49     10.0
4 16 MG       359   .120   12.93    875   13.086    8210      23    152    182    .077    1.7     12   14.0    23     16.0
5 19 MG       174   .090   13.07    375   13.177    6124       8     84     58    .057     .5      5    3.3    10     19.0
6 16 MG       336   .120   13.00    812   13.154    8210      21    151    168    .077    1.6     12   13.0    23     16.0
7  3 MG      2055  2.090   13.21   1587   15.505   19822     263   5397    674    .113   29.7    610   76.1    85      3.0
8 16 MG       247   .120   13.21    925   13.355    8210      15    149    189    .077    1.2     11   14.6    23     16.0
9 C.T.      19461   .190    7.30     57    9.436    1678     346     68      3    .143   49.5     10     .5     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   4.3     31    8.6
1 IDLE       1981   .290   10.56     37   11.048    1633      29     87      2    .232    6.8     20     .4     0     18.5
2 16 MG  64[illegible]   .140   13.07    843   13.274    8210      40    176    173    .077    3.0     13   13.3    23     16.0
3 10 MG       892   .260   13.58   1825   13.930   12973      84    489    564    .147   12.3     72   83.0    49     10.0
4 16 MG       359   .120   13.14    950   13.296    8210      22    150    195    .077    1.7     12   15.0    23     16.0
5 19 MG       224   .110   13.07    950   13.202    6124      10    103     69    .057     .6      6    4.0    10     19.0
6 16 MG       314   .120   13.14    937   13.291    8210      19    150    192    .077    1.5     12   14.1    23     16.0
7  3 MG      2443  2.250   13.07   1587   15.564   19822     311   5788    671    .113   35.2    654   75.8    85      3.0
8 16 MG       242   .120   13.21   1000   13.359    8210      18    149    204    .077    1.4     11   15.7    23     16.0
9 C.T.      18444   .190    7.66     65    9.695    1678     319     66      4    .143   45.7      9     .5     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   4.5     33    9.2
1 IDLE       2215   .230   11.41     50   11.862    1633      30     64      2    .232    7.1     15     .5     0     18.5
2 16 MG       662   .140   13.14    850   13.346    8210      41    174    174    .077    3.1     13   13.4    23     16.0
3 10 MG       743   .190   13.43   1587   13.694   12973      70    364    499    .147   10.3     53   73.4    49     10.0
4 16 MG       370   .120   13.14    850   13.247    8210      23    150    174    .077    1.8     12   13.4    23     16.0
5 19 MG       224   .110   13.07    950   13.202    6124      10    103     69    .057     .6      6    4.0    10     19.0
6 16 MG       382   .130   13.21    925   13.378    8210      23    161    188    .077    1.8     12   14.5    23     16.0
7  3 MG      2386  2.160   13.14   1550   15.539   19822     304   5566    656    .113   34.4    624   74.2    85      3.0
8 16 MG  31[illegible]   .120   13.21    960   13.361    8210      14    149    146    .077    1.5     11   15.1    23     16.0
9 C.T.  [illegible]   .210    7.48     52    9.575    1678     330     74      3    .143   47.2     11     .4     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   4.4     31    8.[illegible]
1 IDLE       2215   .230   11.41     50   11.862    1633      30     64      2    .232    7.1     15     .5     0     18.5
2 16 MG       650   .120   12.86    825   13.045    8210      41    153    172    .077    3.1     12   [illegible]    23     16.0
3 10 MG       811   .220   13.50   1687   13.801   12973      76    418    526    .147   11.2     61   77.4    49     10.0
4 16 MG  [illegible]   .120   13.07    880   13.232    8210      26    150    181    .077    2.0     12   14.0    23     16.0
5 19 MG       174   .090   13.07    356   13.178    6124       8     84     55    .057     .5      5    3.1    10     19.0
6 16 MG       381   .120   13.07    862   13.228    8210      24    150    178    .077    1.8     12   [illegible]    23     16.0
7  3 MG      2274  2.040   13.07   1537   15.328   19822     295   5303    660    .113   33.3    599   74.6    85      3.0
8 16 MG  [illegible]   .120   13.07    956   13.228    8210      24    150    197    .077    1.8     12   15.2    23     16.0
9 C.T.      21339   .200    7.04     59    9.374    1678     382     72      4    .143   54.6     10     .5     0     24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------   4.8     30    8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------   4.4     32    8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------   4.6     31    8.7
FOUR CYCLE COMPOSITE -
                                 HC- FID  0.35(     4.4) + 0.65(     4.6) =    4.526   GM/BHP HR
                                 CO- NDIR 0.35(    32.0) + 0.65(    30.9) =   31.295   GM/BHP HR
                                 NO2-CL   0.35(     8.9) + 0.65(     8.7) =    8.769   GM/BHP HR
                                                     CORRECTED NO2 =    8.344   GM/BHP HR
                                                              BSFC =     .695   LB/BHP HR
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                       TABLE C-10. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-0   TEST 15  RUN-3   1973 STANDARD ENGINE  05-07-73      K = .924     HUM = 54.5  GR/LB
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MODE         CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
             HC      CO     CO2      NO    CARBON    CONS.     HC     CO     NO2    FACT.    HC     CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE      346    .410   10.85      73   11.634     1633      52    116       3    .232    12.2    27     .6     0   18.5
2 16 HG     236    .170   13.20     461   13.625     8210     154    207     192    .077    11.8    16   14.6    23   16.0
3 10 HG     178    .130   13.29    1946   13.612    12973     183    250     458    .147    26.9    37   67.3    44   10.0
4 16 HG     178    .150   13.30     911   13.692     8210     116    182     182    .077     8.9    14   14.0    23   16.0
5 19 HG     164    .110   13.30     390   13.587     6124      80    100      58    .057     4.6     6    3.3    10   19.0
6 16 HG     164    .140   13.34     978   13.707     8210     106    169     194    .077     8.2    13   15.0    23   16.0
7  3 HG     212   2.020   13.43    1604   15.674    14822     289   5159     673    .113    32.7   583   76.1    85    3.0
8 16 HG     142    .150   13.50    1011   13.803     8210      91    180     200    .077     7.0    14   15.4    23   16.0
9 C.T.     1957    .230    7.30      73    9.694     1678     368     81       4    .143    52.6    12     .6     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     6.8    30    8.5
1 IDLE      180    .410   10.85      73   11.454     1633      28    118       3    .232     6.4    27     .6     0   18.5
2 16 HG     126    .160   13.35     944   13.696     8210      82    194     189    .077     6.3    15   14.5    23   16.0
3 10 HG     117    .220   13.88    1749   14.226    12973     115    405     530    .147    16.9    60   77.8    44   10.0
4 16 HG      93    .140   13.50    1000   13.740     8210      60    169     198    .077     4.6    13   15.3    23   16.0
5 19 HG      89    .110   13.50     927   13.706     6124      43     99      63    .057     2.4     6    3.6    10   19.0
6 16 HG      80    .140   13.43     978   13.656     8210      52    170     195    .077     4.0    13   15.0    23   16.0
7  3 HG     155   2.190   13.43    1544   15.787    14822     210   5554     644    .113    23.8   628   72.7    85    3.0
8 16 HG      86    .140   13.50    1045   13.733     8210      56    169     207    .077     4.3    13   16.0    23   16.0
9 C.T.     1915    .200    7.21      73    9.478     1678     366     72       4    .143    52.4    10     .6     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     5.0    32    8.9
1 IDLE      148    .750   11.92     110   12.830     1633      20    193       5    .232     4.7    45    1.1     0   18.5
2 16 HG      88    .130   13.35     951   13.575     8210      57    159     191    .077     4.4    12   14.7    23   16.0
3 10 HG      84    .220   13.88    1728   14.191    12973      83    406     524    .147    12.2    60   77.1    44   10.0
4 16 HG      75    .170   13.58    1045   13.831     8210      48    204     206    .077     3.7    16   15.9    23   16.0
5 19 HG      65    .110   13.58     927   13.760     6124      31     99      63    .057     1.8     6    3.6    10   19.0
6 16 HG      70    .150   13.58    1028   13.806     8210      45    180     203    .077     3.5    14   15.6    23   16.0
7  3 HG     136   2.260   13.73    1544   16.137    14822     180   5608     630    .113    20.4   634   71.2    85    3.0
8 16 HG      70    .130   13.58    1046   13.786     8210      45    156     207    .077     3.5    12   15.9    23   16.0
9 C.T.     1915    .200    7.21      74    9.478     1678     366     72       5    .143    52.4    10     .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.4    33    8.9
1 IDLE      148    .750   11.92     110   12.830     1633      20    193       5    .232     4.7    45    1.1     0   18.5
2 16 HG      75    .130   13.43     863   13.691     8210      49    158     172    .077     3.8    12   13.2    23   16.0
3 10 HG      75    .230   13.95    1770   14.261    12973      74    423     535    .147    10.9    62   78.6    44   10.0
4 16 HG      61    .130   13.65     995   13.846     8210      39    156     196    .077     3.0    12   15.1    23   16.0
5 19 HG      54    .110   13.58     983   13.748     6124      26     99      71    .057     1.5     6    4.1    10   19.0
6 16 HG      61    .130   13.58     995   13.776     8210      39    157     197    .077     3.0    12   15.2    23   16.0
7  3 HG     127   1.980   13.50    1584   15.617    14822     174   5076     667    .113    19.7   574   75.4    85    3.0
8 16 HG      61    .140   13.65    1168   13.856     8210      39    168     230    .077     3.0    13   17.7    23   16.0
9 C.T.     1915    .200    7.12      85    9.388     1678     370     72       5    .143    52.9    10     .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.2    31    9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     5.9    31    8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.3    32    9.0
FOUR CYCLE COMPOSITE -
                               HC- NDIR 0.35(     5.9) + 0.65(     4.3) =    4.861   GM/BHP HR
                               CO- NDIR 0.35(    31.0) + 0.65(    32.0) =   31.669   GM/BHP HR
                               NO2-NDIR 0.35(     8.7) + 0.65(     9.0) =    8.907   GM/BHP HR
                                                   CORRECTED NO2 =    8.234   GM/BHP HR
                                                            BSFC =     .695   LB/BHP HR


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MODE         CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
           HC-FID    CO     CO2   NO-CL    CARBON    CONS.     HC     CO     NO2    FACT.  HC-FID   CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE     2738    .410   10.85      45   11.534     1633      39    117       2    .232     9.0    27     .5     0   18.5
2 16 HG     921    .170   13.20     938   13.462     8210      56    209     190    .077     4.3    16   14.6    23   16.0
3 10 HG     742    .130   13.29    1950   13.494    12973      71    252     463    .147    10.5    37   68.0    44   10.0
4 16 HG     585    .150   13.30     900   13.508     8210      36    184     182    .077     2.7    14   14.0    23   16.0
5 19 HG     292    .110   13.30     375   13.439     6124      13    101      57    .057      .8     6    3.2    10   19.0
6 16 HG     608    .140   13.34     950   13.591     8210      37    171     191    .077     2.8    13   14.7    23   16.0
7  3 HG    2309   2.020   13.43    1575   15.681    14822     292   5158     661    .113    33.0   583   74.7    85    3.0
8 16 HG     518    .150   13.50     987   13.702     8210      31    182     196    .077     2.4    14   15.1    23   16.0
9 C.T.    21423    .230    7.30      78    9.672     1678     372     81       4    .143    53.1    12     .6     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.9    30    8.5
1 IDLE     2738    .410   10.85      45   11.534     1633      39    117       2    .232     9.0    27     .5     0   18.5
2 16 HG     787    .160   13.35     925   13.589     8210      48    195     186    .077     3.7    15   14.3    23   16.0
3 10 HG     927    .220   13.88    1725   14.193    12973      85    406     523    .147    12.5    60   77.0    44   10.0
4 16 HG     446    .140   13.50     987   13.690     8210      30    170     197    .077     2.3    13   15.1    23   16.0
5 19 HG     225    .110   13.50     913   13.633     6124      10    100      62    .057      .6     6    3.5    10   19.0
6 16 HG     495    .140   13.43     963   13.620     8210      30    170     193    .077     2.3    13   14.6    23   16.0
7  3 HG    2312   2.190   13.43    1513   15.851    14822     289   5532     628    .113    32.7   625   71.0    85    3.0
8 16 HG     428    .140   13.50    1038   13.683     8210      26    170     207    .077     2.0    13   15.9    23   16.0
9 C.T.    21270    .200    7.21      82    9.537     1678     374     71       5    .143    53.5    10     .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.9    32    8.8
1 IDLE     2145    .750   11.92      50   12.885     1633      27    192       2    .232     6.3    45     .5     0   18.5
2 16 HG     742    .130   13.35     913   13.559     8210      45    159     184    .077     3.5    12   14.1    23   16.0
3 10 HG     814    .220   13.88    1700   14.181    12973      74    407     516    .147    10.9    60   75.9    44   10.0
4 16 HG     530    .170   13.58    1013   13.803     8210      32    204     200    .077     2.4    16   15.4    23   16.0
5 19 HG     225    .110   13.58     900   13.713     6124      10     99      59    .057      .6     6    3.4    10   19.0
6 16 HG     507    .150   13.58    1000   13.781     8210      30    181     198    .077     2.3    14   15.2    23   16.0
7  3 HG    2434   2.260   13.73    1385   16.233    14822     297   5574     537    .113    33.6   630   60.7    85    3.0
8 16 HG     406    .130   13.58    1013   13.751     8210      24    157     201    .077     1.9    12   15.5    23   16.0
9 C.T.    22066    .200    7.21      83    9.617     1678     385     70       5    .143    55.1    10     .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.8    33    8.3
1 IDLE     2145    .750   11.92      50   12.885     1633      27    192       2    .232     6.3    45     .5     0   18.5
2 16 HG     675    .130   13.43     825   13.628     8210      41    158     165    .077     3.1    12   12.7    23   16.0
3 10 HG     792    .230   13.95    1730   14.259    12973      72    423     523    .147    10.6    62   76.9    44   10.0
4 16 HG     406    .130   13.65     925   13.821     8210      24    156     182    .077     1.9    12   14.0    23   16.0
5 19 HG     192    .110   13.58     950   13.709     6124       9     99      67    .057      .5     6    3.8    10   19.0
6 16 HG     406    .130   13.58     950   13.751     8210      24    157     184    .077     1.9    12   14.2    23   16.0
7  3 HG    2126   1.980   13.50    1487   15.693    14822     269   5052     624    .113    30.4   571   70.5    85    3.0
8 16 HG     406    .140   13.65    1182   13.831     8210      24    168     217    .077     1.9    13   16.7    23   16.0
9 C.T.    20980    .200    7.12      84    9.368     1678     367     72       5    .143    52.5    10     .7     0   24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.5    31    8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.9    31    8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.6    32    8.5
FOUR CYCLE COMPOSITE -
                               HC- FID  0.35(     4.9) + 0.65(     4.6) =    4.730   GM/BHP HR
                               CO- NDIR 0.35(    31.0) + 0.65(    31.9) =   31.569   GM/BHP HR
                               NO2-CL   0.35(     8.6) + 0.65(     8.5) =    8.532   GM/BHP HR
                                                   CORRECTED NO2 =    7.988   GM/BHP HR
                                                            BSFC =     .695   LB/BHP HR
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                     TABLE C-11. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-0   TEST 20  RUN-1   1973 STANDARD ENGINE  08-16-73      K =1.080     HUM =107.4  GR/LB
---------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED       TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR             MAN.
MODE             HC      CO     CO2     NO      CARBON   CONS.     HC      CO     NO2    FACT.    HC       CO     NO2    HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE           81    .520   10.38     81    10.987    2132      17     204      5    .232     3.9      47     1.2     0    16.9
2 16 HG          47    .230   13.19    466    13.471    7938      30     274     91    .077     2.3      21     7.0    21    16.0
3 10 HG          49    .280   13.50    964    13.833   12338      47     504    285    .147     6.9      74    42.0    46    10.0
4 16 HG          44    .220   13.36    526    13.628    7938      28     259    102    .077     2.1      20     7.8    21    16.0
5 19 HG          31    .180   13.52    257    13.733    5988      15     159     37    .057      .8       9     2.1     7    19.0
6 16 HG          31    .210   13.20    487    13.443    7938      20     250     95    .077     1.5      19     7.4    21    16.0
7  3 HG          87   1.850   13.43   1170    15.374   19006     116    4620    480    .113    13.1     522    54.3    80     3.0
8 16 HG          26    .210   13.39    543    13.628    7938      16     247    105    .077     1.3      19     8.1    21    16.0
9 C.T.         1684    .590    8.46     47    10.868    2132     357     234      3    .143    51.0      33      .4     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.7      34     5.7
1 IDLE           81    .520   10.38     81    10.987    2132      17     204      5    .232     3.9      47     1.2     0    16.9
2 16 HG          61    .210   13.19    443    13.466    7938      39     250     87    .077     3.0      19     6.7    21    16.0
3 10 HG          58    .200   13.41   1019    13.673   12338      57     365    304    .147     8.3      54    44.7    46    10.0
4 16 HG          48    .210   13.28    537    13.592    7938      30     249    105    .077     2.3      19     8.0    21    16.0
5 19 HG          42    .170   13.35    267    13.565    5988      20     152     39    .057     1.1       9     2.2     7    19.0
6 16 HG          44    .210   13.24    529    13.498    7938      28     249    103    .077     2.2      19     8.0    21    16.0
7  3 HG         109   1.490   13.48   1314    15.282   19006     140    4246    543    .113    15.8     480    61.3    80     3.0
8 16 HG          48    .210   13.36    575    13.622    7938      30     247    111    .077     2.3      19     8.6    21    16.0
9 C.T.         1629    .580    8.58     44    10.919    2132     344     229      3    .143    49.1      33      .4     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.9      31     6.2
1 IDLE          123    .890   11.09    102    12.113    2132      23     316      6    .232     5.4      73     1.4     0    16.9
2 16 HG          58    .220   13.23    453    13.513    7938      37     261     88    .077     2.8      20     6.8    21    16.0
3 10 HG          54    .200   13.41   1005    13.668   12338      53     365    301    .147     7.7      54    44.3    46    10.0
4 16 HG          47    .200   13.24    507    13.591    7938      30     237     99    .077     2.3      18     7.6    21    16.0
5 19 HG          42    .170   13.41    240    13.625    5988      20     151     35    .057     1.1       9     2.0     7    19.0
6 16 HG          46    .200   13.25    525    13.500    7938      29     238    102    .077     2.2      18     7.9    21    16.0
7  3 HG         107   2.110   13.33   1106    15.556   19006     141    5208    449    .113    16.0     589    50.7    80     3.0
8 16 HG          46    .200   13.37    556    13.620    7938      29     235    108    .077     2.2      18     8.3    21    16.0
9 C.T.         1604    .600    8.63     44    10.962    2132     337     236      3    .143    48.2      34      .4     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.9      37     5.7
1 IDLE          123    .890   11.09    102    12.113    2132      23     316      6    .232     5.4      73     1.4     0    16.9
2 16 HG          59    .210   13.19    473    13.464    7938      38     250     93    .077     2.9      19     7.1    21    16.0
3 10 HG          59    .210   13.50   1001    13.767   12338      51     380    298    .147     7.5      56    43.8    46    10.0
4 16 HG          45    .220   13.35    540    13.614    7938      28     259    104    .077     2.2      20     8.0    21    16.0
5 19 HG          40    .160   13.40    281    13.603    5988      19     142     41    .057     1.1       8     2.3     7    19.0
6 16 HG          42    .200   13.26    509    13.505    7938      27     237     99    .077     2.1      18     7.6    21    16.0
7  3 HG          97   1.560   13.61   1259    15.279   19006     130    3921    520    .113    14.7     443    58.8    80     3.0
8 16 HG          46    .200   13.39    568    13.640    7938      29     235    110    .077     2.2      18     8.5    21    16.0
9 C.T.         1558    .550    8.67     54    10.903    2132     329     217      4    .143    47.1      31      .5     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.7      30     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     3.8      32     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     3.8      33     5.9
FOUR CYCLE COMPOSITE =                      HC- NDIR 0.35(     3.8) + 0.65(     3.8) =    3.792   GM/BHP HR
                                            CO- NDIR 0.35(    32.2) + 0.65(    33.4) =   32.979   GM/BHP HR
                                            NO2-NDIR 0.35(     6.0) + 0.65(     5.9) =    5.908   GM/BHP HR
                                                                 CORRECTED NO2 =    6.383   GM/BHP HR
                                                                          BSFC =     .732   LB/BHP HR


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                 CONCENTRATION AS MEASURED       TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR             MAN.
MODE           HC-FID    CO     CO2   NO-CL     CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL   HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE         1321    .520   10.38     55    11.032    2132      26     203      4    .232     5.9      47      .8     0    16.9
2 16 HG         646    .230   13.19    470    13.485    7938      38     273     92    .077     2.9      21     7.1    21    16.0
3 10 HG         620    .280   13.50   1012    13.892   12338      55     504    299    .147     8.1      74    44.0    46    10.0
4 16 HG         407    .220   13.36    550    13.621    7938      24     259    106    .077     1.8      20     8.2    21    16.0
5 19 HG         225    .180   13.52    262    13.723    5988      10     159     38    .057      .6       9     2.2     7    19.0
6 16 HG         351    .210   13.20    500    13.445    7938      21     250     98    .077     1.6      19     7.5    21    16.0
7  3 HG        1947   1.850   13.43   1275    15.480   19006     245    4588    520    .113    27.7     518    58.7    80     3.0
8 16 HG         310    .210   13.39    575    13.631    7938      18     247    111    .077     1.4      19     8.6    21    16.0
9 C.T.        20807    .590    8.46     25    11.131    2132     399     228      2    .143    57.0      33      .2     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.7      33     6.0
1 IDLE         1321    .520   10.38     55    11.032    2132      26     203      4    .232     5.9      47      .8     0    16.9
2 16 HG         547    .210   13.19    475    13.455    7938      32     250     93    .077     2.5      19     7.2    21    16.0
3 10 HG         520    .200   13.41   1037    13.662   12338      47     365    311    .147     6.9      54    45.7    46    10.0
4 16 HG         394    .210   13.28    575    13.529    7938      23     249    112    .077     1.8      19     8.6    21    16.0
5 19 HG         197    .170   13.35    275    13.590    5988       9     152     40    .057      .5       9     2.3     7    19.0
6 16 HG         365    .210   13.24    550    13.487    7938      22     250    107    .077     1.7      19     8.3    21    16.0
7  3 HG        2024   1.690   13.48   1275    15.372   19006     250    4221    523    .113    28.3     477    59.1    80     3.0
8 16 HG         295    .210   13.36    625    13.599    7938      17     248    121    .077     1.3      19     9.3    21    16.0
9 C.T.        20393    .580    8.58     25    11.199    2132     388     223      2    .143    55.5      32      .2     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.6      31     6.2
1 IDLE         1707    .890   11.09     25    12.151    2132      30     315      4    .232     7.0      73     1.0     0    16.9
2 16 HG         562    .220   13.23    475    13.506    7938      33     261     93    .077     2.5      20     7.1    21    16.0
3 10 HG         520    .200   13.41   1075    13.662   12338      47     365    322    .147     6.9      54    47.4    46    10.0
4 16 HG         323    .200   13.29    562    13.522    7938      19     237    110    .077     1.4      18     8.4    21    16.0
5 19 HG         182    .170   13.41    250    13.598    5988       8     151     37    .057      .5       9     2.1     7    19.0
6 16 HG         323    .200   13.25    550    13.482    7938      19     238    108    .077     1.5      18     8.3    21    16.0
7  3 HG        2143   2.110   13.33   1175    15.654   19006     260    5175    474    .113    29.4     585    53.5    80     3.0
8 16 HG         267    .200   13.37    600    13.597    7938      16     236    115    .077     1.2      18     9.0    21    16.0
9 C.T.        20622    .600    8.63     25    11.292    2132     389     229      2    .143    55.7      33      .2     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.7      36     6.0
1 IDLE         1707    .890   11.09     25    12.151    2132      30     315      4    .232     7.0      73     1.0     0    16.9
2 16 HG         534    .210   13.19    475    13.453    7938      32     250     93    .077     2.4      19     7.2    21    16.0
3 10 HG         535    .210   13.50   1100    13.764   12338      48     380    327    .147     7.1      56    48.1    46    10.0
4 16 HG         338    .220   13.35    562    13.604    7938      20     259    109    .077     1.5      20     8.4    21    16.0
5 19 HG         169    .160   13.40    275    13.577    5988       7     143     40    .057      .4       8     2.3     7    19.0
6 16 HG         309    .200   13.26    562    13.491    7938      18     238    110    .077     1.4      18     8.5    21    16.0
7  3 HG        1934   1.560   13.61   1425    15.364   19006     240    3898    585    .113    27.1     440    66.1    80     3.0
8 16 HG         253    .200   13.39    612    13.615    7938      15     236    118    .077     1.1      18     9.1    21    16.0
9 C.T.        20403    .550    8.67     25    11.260    2132     386     210      2    .143    55.2      30      .2     0    29.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.5      30     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     4.6      32     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     4.6      33     6.3
FOUR CYCLE COMPOSITE =                      HC- FID  0.35(     4.6) + 0.65(     4.6) =    4.617   GM/BHP HR
                                            CO- NDIR 0.35(    32.0) + 0.65(    33.2) =   32.794   GM/BHP HR
                                            NO2-CL   0.35(     6.1) + 0.65(     6.3) =    6.260   GM/BHP HR
                                                                 CORRECTED NO2 =    6.764   GM/BHP HR
                                                                          BSFC =     .733   LB/BHP HR
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                    TABLE C-12. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-0   TEST 70  RUN-2   1973 STANDARD ENGINE  08-16-73      K =1.069      HUM =101.6  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR                    MAN.
MODE          HC      CO     CO2      NO    CARBON    CONS.     HC       CO      NO2   FACT.    HC         CO     NO2      HP      VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE        78    .530   10.90      80    11.019    2132      16      207       5    .232    3.8         48     1.2      0      16.9
2 16 HG       42    .190   13.17     451    13.405    7938      27      227      89    .077    2.1         17     6.8     21      16.0
3 10 HG       31    .190   13.60    1087    13.823   12338      30      393     322    .147    4.4         58    47.3     46      10.0
4 16 HG       34    .170   13.38     557    13.587    7938      21      201     108    .077    1.7         15     8.3     21      16.0
5 19 HG       30    .130   13.38     278    13.542    5988      19      116      41    .057     .8          7     2.3      7      19.0
6 16 HG       30    .170   13.29     556    13.492    7938      19      202     109    .077    1.5         16     8.4     21      16.0
7  3 HG       79   1.550   13.64    1966    15.275   19006     106     3896     606    .113   12.0        440    68.4     80       3.0
8 16 HG       21    .180   13.52     635    13.723    7938      13      210     122    .077    1.0         16     9.4     21      16.0
9 C.T.      1640    .560    8.43      63    10.761    2132     351      224       4    .143   50.2         32      .6      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   3.4         28     6.7
1 IDLE        78    .530   10.90      80    11.019    2132      16      207       5    .232    3.8         48     1.2      0      16.9
2 16 HG       41    .190   13.34     515    13.574    7938      26      224     100    .077    2.0         17     7.7     21      16.0
3 10 HG       36    .170   13.58    1109    13.789   12338      35      307     329    .147    5.1         45    48.4     46      10.0
4 16 HG       32    .160   13.38     581    13.575    7938      20      189     113    .077    1.6         15     8.7     21      16.0
5 19 HG       28    .130   13.51     281    13.670    5928      13      115      41    .057     .8          7     2.3      7      19.0
6 16 HG       30    .160   13.35     551    13.542    7938      19      189     107    .077    1.5         15     8.3     21      16.0
7  3 HG       74   1.920   13.48    1305    15.480   19006      98     4762     532    .113   11.1        538    60.1     80       3.0
8 16 HG       26    .160   13.45     631    13.638    7938      16      198     122    .077    1.3         15     9.4     21      16.0
9 C.T.      1533    .480    8.58      58    10.716    2132     329      193       4    .143   47.1         28      .5      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   3.3         32     6.4
1 IDLE        85    .800   10.92     119    11.812    2132      17      292       7    .232    3.8         68     1.7      0      16.9
2 16 HG       38    .180   13.29     510    13.511    7938      24      214      99    .077    1.9         16     7.7     21      16.0
3 10 HG       37    .170   13.56    1118    13.770   12338      36      308     333    .147    5.3         45    48.9     46      10.0
4 16 HG       35    .160   13.41     592    13.604    7938      22      189     114    .077    1.7         15     8.8     21      16.0
5 19 HG       31    .130   13.53     290    13.693    5988      15      115      42    .057     .8          7     2.4      7      19.0
6 16 HG       35    .160   13.33     574    13.528    7938      22      190     112    .077    1.7         15     8.6     21      16.0
7  3 HG       86   1.570   13.65    1948    15.319   19006     115     3936     597    .113   13.0        445    67.4     80       3.0
8 16 HG       29    .170   13.54     626    13.741    7938      18      198     120    .077    1.4         15     9.2     21      16.0
9 C.T.      1524    .510    8.62      72    10.776    2132     326      204       5    .143   46.6         29      .7      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   3.3         29     6.8
1 IDLE        85    .800   10.92     119    11.812    2132      17      292       7    .232    3.8         68     1.7      0      16.9
2 16 HG       41    .180   13.36     525    13.584    7938      26      212     102    .077    2.0         16     7.8     21      16.0
3 10 HG       42    .160   13.50    1110    13.705   12338      41      291     332    .147    6.0         43    48.8     46      10.0
4 16 HG       34    .150   13.39     582    13.577    7938      21      177     113    .077    1.7         14     8.7     21      16.0
5 19 HG       32    .130   13.49     295    13.655    5988      15      115      43    .057     .9          7     2.4      7      19.0
6 16 HG       26    .160   13.38     584    13.568    7938      16      189     113    .077    1.3         15     8.7     21      16.0
7  3 HG       81   1.870   13.50    1327    15.457   19006     108     4645     542    .113   12.2        525    61.2     80       3.0
8 16 HG       29    .170   13.43     657    13.631    7938      18      200     127    .077    1.4         15     9.8     21      16.0
9 C.T.      1524    .510    8.61     105    10.766    2132     326      204       7    .143   46.6         29     1.0      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   3.3         32     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------   3.3         30     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------   3.3         30     6.7
FOUR CYCLE COMPOSITE -
                                        HC- NDIR 0.35(     3.3) + 0.65(     3.3) =     3.337   GM/BHP HR
                                        CO- NDIR 0.35(    30.1) + 0.65(    30.5) =    30.322   GM/BHP HR
                                        NO2-NDIR 0.35(     6.6) + 0.65(     6.7) =     6.669   GM/BHP HR
                                                         CORRECTED NO2 =     7.131   GM/BHP HR
                                                                  BSFC =      .732   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR                    MAN.
MODE        HC-FID    CO     CO2   NO-CL    CARBON    CONS.     HC       CO      NO2   FACT.  HC-FID       CO   NO2-CL    HP      VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE      1519    .530   10.90      50    11.081    2132      29      206       3    .232    6.8         48      .7      0      16.9
2 16 HG      547    .190   13.17     410    13.915    7938      32      227      81    .077    2.5         17     6.2     21      16.0
3 10 HG      564    .190   13.60     980    13.846   12338      50      392     290    .147    7.4         58    42.6     46      10.0
4 16 HG      366    .170   13.38     525    13.587    7938      21      201     102    .077    1.6         15     7.8     21      16.0
5 19 HG      169    .130   13.38     250    13.527    5988       7      116      37    .057     .4          7     2.1      7      19.0
6 16 HG      337    .170   13.29     550    13.494    7938      20      202     107    .077    1.5         16     8.3     21      16.0
7  3 HG     1838   1.550   13.64    1325    15.374   19006     227     3871     544    .113   25.7        437    61.5     80       3.0
8 16 HG      282    .180   13.52     600    13.728    7938      16      210     115    .077    1.3         16     8.9     21      16.0
9 C.T.     21663    .560    8.43      25    11.156    2132     414      216       2    .143   59.2         31      .2      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   4.7         28     6.1
1 IDLE      1519    .530   10.90      50    11.081    2132      29      206       3    .232    6.8         48      .7      0      16.9
2 16 HG      506    .190   13.34     476    13.581    7938      30      224      92    .077    2.3         17     7.1     21      16.0
3 10 HG      479    .170   13.58    1062    13.798   12338      43      307     315    .147    6.3         45    46.3     46      10.0
4 16 HG      309    .160   13.38     562    13.571    7938      18      189     109    .077    1.4         15     8.4     21      16.0
5 19 HG      169    .130   13.51     250    13.657    5988       7      115      36    .057     .4          7     2.1      7      19.0
6 16 HG      281    .160   13.35     525    13.538    7938      16      190     102    .077    1.3         15     7.9     21      16.0
7  3 HG     1942   1.920   13.48    1300    15.594   19006     237     4727     526    .113   26.7        534    59.4     80       3.0
8 16 HG      239    .160   13.45     600    13.634    7938      14      188     116    .077    1.1         14     8.9     21      16.0
9 C.T.     19508    .480    8.58      25    11.011    2132     378      188       2    .143   54.0         27      .2      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   4.4         32     6.2
1 IDLE      1620    .800   10.92      75    11.882    2132      29      290       4    .232    6.7         67     1.0      0      16.9
2 16 HG      463    .180   13.24     475    13.516    7938      27      214      93    .077    2.1         16     7.1     21      16.0
3 10 HG      464    .170   13.56    1075    13.776   12338      42      308     320    .147    6.1         45    47.0     46      10.0
4 16 HG      310    .160   13.41     550    13.601    7938      18      189     107    .077    1.4         15     8.2     21      16.0
5 19 HG      169    .130   13.53     262    13.677    5988       7      115      38    .057     .4          7     2.2      7      19.0
6 16 HG      281    .160   13.33     575    13.518    7938      17      190     112    .077    1.3         15     8.6     21      16.0
7  3 HG     1797   1.570   13.65    1375    15.400   19006     222     3914     563    .113   25.1        442    63.7     80       3.0
8 16 HG      239    .170   13.54     587    13.734    7938      14      198     113    .077    1.1         15     8.7     21      16.0
9 C.T.     19520    .510    8.62      38    11.082    2132     376      198       2    .143   53.7         28      .3      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   4.3         29     6.4
1 IDLE      1620    .800   10.92      75    11.882    2132      29      290       4    .232    6.7         67     1.0      0      16.9
2 16 HG      478    .180   13.36     475    13.588    7938      29      212      92    .077    2.2         16     7.1     21      16.0
3 10 HG      464    .160   13.50    1050    13.706   12338      42      291     314    .147    6.1         43    46.1     46      10.0
4 16 HG      241    .150   13.39     525    13.568    7938      16      177     102    .077    1.3         14     7.9     21      16.0
5 19 HG      154    .130   13.49     250    13.635    5988       7      115      36    .057     .4          7     2.1      7      19.0
6 16 HG      281    .160   13.38     550    13.568    7938      16      189     107    .077    1.3         15     8.2     21      16.0
7  3 HG     1942   1.870   13.50    1300    15.564   19006     237     4613     527    .113   26.8        521    59.6     80       3.0
8 16 HG      253    .170   13.43     600    13.625    7938      15      200     116    .077    1.1         15     8.9     21      16.0
9 C.T.     19952    .510    8.61      25    11.115    2132     383      198       2    .143   54.7         28      .2      0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   4.4         32     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------   4.5         30     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------   4.4         30     6.3
FOUR CYCLE COMPOSITE -
                                        HC- FID  0.35(     4.5) + 0.65(     4.4) =     4.426   GM/BHP HR
                                        CO- NDIR 0.35(    29.9) + 0.65(    30.3) =    30.128   GM/BHP HR
                                        NO2-CL   0.35(     6.1) + 0.65(     6.3) =     6.265   GM/BHP HR
                                                         CORRECTED NO2 =     6.699   GM/BHP HR
                                                                  BSFC =      .732   LB/BHP HR
                    TABLE C-13. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-    TEST 20  RUN=3   1973 STANDARD ENGINE  08-16-73      K =1.085     HUM =110.4  GR/LB
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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.     WEIGHTED GM/HR               MAN.
MODE        HC      CO     CO2      NO  CARBON   CONS.      HC      CO    NO2   FACT.    HC       CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE     100    .590   10.84      44  11.538    2132      20     202      6   .232     4.6      47    1.3     0   16.9
2 16 HG     55    .210   13.53     430  13.799    7938      34     249     90   .077     2.6      19    6.9    21   16.0
3 10 HG     46    .170   13.79    1049  14.010   12338      44     302    305   .147     6.4      44   44.9    46   10.0
4 16 HG     47    .170   13.64     541  13.861    7938      29     197    105   .077     2.2      15    8.1    21   16.0
5 19 HG     42    .140   13.69     276  13.875    5988      20     122     40   .057     1.1       7    2.3     7   19.0
6 16 HG     36    .170   13.59     527  13.799    7938      22     198    101   .077     1.7      15    7.8    21   16.0
7  3 HG     97   1.950   13.82    1264  15.875   19006     125    4716    504   .113    14.2     533   57.0    80    3.0
8 16 HG     45    .180   13.83     584  14.059    7938      27     205    109   .077     2.1      16    8.4    21   16.0
9 C.T.    1587    .550    8.60      30  10.869    2132     336     218      5   .143    48.1      31     .7     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      3.7      32    6.0
1 IDLE     100    .590   10.84      44  11.538    2132      20     202      6   .232     4.6      47    1.3     0   16.9
2 16 HG     40    .190   13.58     520  13.813    7938      25     221     99   .077     1.9      17    7.6    21   16.0
3 10 HG     39    .180   13.81    1051  14.032   12338      37     320    307   .147     5.4      47   45.1    46   10.0
4 16 HG     40    .160   13.71     580  13.913    7938      25     184    110   .077     1.9      14    8.5    21   16.0
5 19 HG     30    .130   13.83     307  13.992    5988      14     112     44   .057      .8       6    2.5     7   19.0
6 16 HG     27    .160   13.59     570  13.779    7938      17     186    111   .077     1.3      14    8.5    21   16.0
7  3 HG     73   1.670   13.86    1528  15.609   19006      96    4108    577   .113    10.8     464   65.2    80    3.0
8 16 HG     35    .160   13.79     597  13.988    7938      21     193    112   .077     1.7      14    8.7    21   16.0
9 C.T.    1631    .530    8.61      52  10.901    2132     344     209      3   .143    49.3      30     .5     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      3.4      29    6.5
1 IDLE     100    .900   11.06     106  12.068    2132      19     321      6   .232     4.4      75    1.4     0   16.9
2 16 HG     40    .180   13.66     535  13.883    7938      25     208    102   .077     1.9      16    7.8    21   16.0
3 10 HG     41    .180   13.87    1052  14.094   12338      39     318    306   .147     5.7      47   44.9    46   10.0
4 16 HG     37    .180   13.73     542  13.950    7938      23     207    102   .077     1.8      16    7.9    21   16.0
5 19 HG     33    .130   13.81     264  13.976    5988      15     113     38   .057      .9       6    2.1     7   19.0
6 16 HG     38    .160   13.66     528  13.861    7938      24     185    100   .077     1.8      14    7.7    21   16.0
7  3 HG    100   2.510   13.71    1225  16.328   19006     126    5902    473   .113    14.2     667   53.5    80    3.0
8 16 HG     47    .160   13.77     595  13.981    7938      29     184    112   .077     2.2      14    8.6    21   16.0
9 C.T.    1652    .520    8.64      60  10.949    2132     348     205      4   .143    49.7      29     .6     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      3.6      39    5.9
1 IDLE     100    .900   11.06     106  12.068    2132      19     321      6   .232     4.4      75    1.4     0   16.9
2 16 HG     41    .190   13.57     517  13.804    7938      25     221     99   .077     2.0      17    7.6    21   16.0
3 10 HG     42    .170   13.76    1105  13.975   12338      40     303    324   .147     5.9      45   47.6    46   10.0
4 16 HG     42    .180   13.70     604  13.925    7938      26     207    114   .077     2.0      16    8.8    21   16.0
5 19 HG     38    .130   13.78     284  13.951    5988      18     113     40   .057     1.0       6    2.3     7   19.0
6 16 HG     41    .180   13.63     574  13.854    7938      25     208    110   .077     2.0      16    8.5    21   16.0
7  3 HG     87   1.810   13.80    1346  15.704   19006     114    4425    541   .113    12.8     500   61.1    80    3.0
8 16 HG     39    .170   13.72     621  13.932    7938      24     196    117   .077     1.8      15    9.0    21   16.0
9 C.T.    1596    .510    8.69      61  10.928    2132     336     201      4   .143    48.1      29     .6     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      3.5      32    6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------      3.5      30    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------      3.6      35    6.2
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.5) + 0.65(     3.6) =    3.561   GM/BHP HR
                                        CO- NDIR 0.35(    30.4) + 0.65(    35.2) =   33.526   GM/BHP HR
                                        NO2-NDIR 0.35(     6.3) + 0.65(     6.2) =    6.218   GM/BHP HR
                                                            CORRECTED NO2 =    6.749   GM/BHP HR
                                                                     BSFC =     .732   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.     WEIGHTED GM/HR               MAN.
MODE      HC-FID    CO     CO2   NO-CL  CARBON   CONS.      HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE    1527    .590   10.84      45  11.583    2132      28     201      3   .232     6.5      47     .6     0   16.9
2 16 HG    620    .210   13.53     430  13.802    7938      36     249     82   .077     2.7      19    6.3    21   16.0
3 10 HG    536    .170   13.79     975  14.014   12338      47     302    285   .147     6.9      44   41.9    46   10.0
4 16 HG    381    .170   13.64     510  13.848    7938      22     197     97   .077     1.7      15    7.5    21   16.0
5 19 HG    197    .140   13.69     230  13.850    5988       9     122     33   .057      .5       7    1.9     7   19.0
6 16 HG    338    .170   13.59     485  13.794    7938      19     198     93   .077     1.5      15    7.1    21   16.0
7  3 HG   2091   1.950   13.82    1175  15.979   19006     249    4685    464   .113    28.1     529   52.4    80    3.0
8 16 HG    289    .180   13.83     537  14.039    7938      16     206    101   .077     1.3      16    7.8    21   16.0
9 C.T.   20608    .550    8.60      19  11.211    2132     392     211      1   .143    56.0      30     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      4.6      32    5.5
1 IDLE    1527    .590   10.84      45  11.583    2132      28     201      3   .232     6.5      47     .6     0   16.9
2 16 HG    536    .190   13.58     425  13.824    7938      31     220     91   .077     2.4      17    7.0    21   16.0
3 10 HG    490    .180   13.81     975  14.038   12338      42     320    284   .147     6.2      47   41.8    46   10.0
4 16 HG    310    .160   13.71     513  13.901    7938      18     184     97   .077     1.4      14    7.5    21   16.0
5 19 HG    169    .130   13.83     250  13.977    5988       7     113     36   .057      .4       6    2.0     7   19.0
6 16 HG    282    .160   13.59     500  13.778    7938      16     186     96   .077     1.3      14    7.4    21   16.0
7  3 HG   1887   1.670   13.86    1300  15.719   19006     228    4079    522   .113    25.8     461   59.0    80    3.0
8 16 HG    254    .160   13.79     563  13.975    7938      14     184    106   .077     1.1      14    8.2    21   16.0
9 C.T.   20173    .530    8.61      20  11.157    2132     385     205      1   .143    55.1      29     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      4.4      29    5.9
1 IDLE    1653    .900   11.06      75  12.125    2132      29     320      4   .232     6.7      74    1.0     0   16.9
2 16 HG    550    .180   13.66     500  13.895    7938      31     208     95   .077     2.4      16    7.3    21   16.0
3 10 HG    508    .180   13.87    1025  14.101   12338      44     318    298   .147     6.5      47   43.8    46   10.0
4 16 HG    325    .180   13.73     538  13.943    7938      19     207    102   .077     1.4      16    7.8    21   16.0
5 19 HG    169    .130   13.81     250  13.957    5988       7     113     36   .057      .4       6    2.0     7   19.0
6 16 HG    282    .160   13.66     507  13.848    7938      16     185     96   .077     1.2      14    7.4    21   16.0
7  3 HG   2056   2.510   13.71    1150  16.426   19006     238    5867    442   .113    26.9     663   49.9    80    3.0
8 16 HG    263    .160   13.77     568  13.956    7938      15     184    107   .077     1.2      14    8.3    21   16.0
9 C.T.   20393    .520    8.64      20  11.199    2132     388     200      1   .143    55.5      29     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      4.5      39    5.6
1 IDLE    1653    .900   11.06      75  12.125    2132      29     320      4   .232     6.7      74    1.0     0   16.9
2 16 HG    522    .190   13.57     500  13.812    7938      30     221     95   .077     2.3      17    7.3    21   16.0
3 10 HG    494    .170   13.76    1075  13.979   12338      44     303    315   .147     6.4      45   46.3    46   10.0
4 16 HG    339    .180   13.70     525  13.914    7938      19     207    109   .077     1.5      16    8.4    21   16.0
5 19 HG    184    .130   13.78     263  13.928    5988       8     113     38   .057      .5       6    2.1     7   19.0
6 16 HG    310    .180   13.63     563  13.841    7938      18     209    107   .077     1.4      16    8.3    21   16.0
7  3 HG   1917   1.810   13.80    1325  15.802   19006     231    4398    529   .113    26.1     497   59.8    80    3.0
8 16 HG    254    .170   13.72     600  13.915    7938      14     196    114   .077     1.1      15    8.7    21   16.0
9 C.T.   20183    .510    8.69      20  11.218    2132     384     196      1   .143    54.9      28     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------      4.4      31    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------      4.5      30    5.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------      4.5      35    5.9
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.5) + 0.65(     4.5) =    4.483   GM/BHP HR
                                        CO- NDIR 0.35(    30.2) + 0.65(    35.0) =   33.328   GM/BHP HR
                                        NO2-CL   0.35(     5.7) + 0.65(     5.9) =    5.852   GM/BHP HR
                                                            CORRECTED NO2 =    6.352   GM/BHP HR
                                                                     BSFC =     .732   LB/BHP HR
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TABLE C-14. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 3-D   TEST 87  RUN 1   1973 STANDARD ENGINE  09-06-73     K =1.064     HUM = 99.1  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR               MAN.
MODE           HC      CO      CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE         141    .170   10.45     71    10.772    2132      30      68       5    .232     7.0       16     1.1     0    16.6
2 16 HG         55    .170   13.14    488    13.369    7893      35     203      96    .077     2.7       16     7.4    22    16.0
3 10 HG         60    .210   13.97   1488    14.295   12111      55     361     420    .147     8.1       53    61.7    48    10.0
4 16 HG         39    .140   13.28    549    13.462    7893      25     166     107    .077     1.9       13     8.2    22    16.0
5 19 HG         32    .120   13.31    287    13.465    5806      15     105      41    .057      .8        6     2.3     8    19.0
6 16 HG         36    .140   13.22    547    13.399    7893      23     167     107    .077     1.8       13     8.2    22    16.0
7  3 HG        105   2.480   13.05   1074    15.643   19868     144    6362     453    .113    16.3      719    51.2    81     3.0
8 16 HG         35    .150   13.35    564    13.538    7893      22     177     109    .077     1.7       14     8.4    22    16.0
9 C.T.        1518    .320    7.88     69     9.839    2313     385     152       5    .143    55.1       22      .7     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     4.1       37     6.4
1 IDLE         141    .170   10.45     71    10.772    2132      30      68       5    .232     7.0       16     1.1     0    16.6
2 16 HG         46    .150   13.18    483    13.380    7893      29     179      94    .077     2.3       14     7.3    22    16.0
3 10 HG         52    .170   13.86   1443    14.086   12111      48     295     412    .147     7.1       43    60.5    48    10.0
4 16 HG         35    .130   13.31    555    13.478    7893      22     159     108    .077     1.7       12     8.3    22    16.0
5 19 HG         30    .120   13.36    266    13.512    5806      14     104      38    .057      .8        6     2.2     8    19.0
6 16 HG         33    .150   13.32    546    13.506    7893      21     177     106    .077     1.6       14     8.2    22    16.0
7  3 HG        104   2.660   13.01   1073    15.782   19868     141    6764     448    .113    16.0      764    50.7    81     3.0
8 16 HG         35    .140   13.36    587    13.538    7893      22     165     114    .077     1.7       13     8.7    22    16.0
9 C.T.        1497    .330    8.03     62     9.977    2313     375     155       5    .143    53.6       22      .7     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.9       39     6.3
1 IDLE         209    .230   10.60     98    11.056    2132      44      90       6    .232    10.1       21     1.5     0    16.6
2 16 HG         45    .160   13.24    511    13.449    7893      29     190     100    .077     2.2       15     7.7    22    16.0
3 10 HG         61    .310   14.06   1517    14.436   12111      55     525     423    .147     8.1       77    62.1    48    10.0
4 16 HG         35    .150   13.36    569    13.548    7893      22     177     110    .077     1.7       14     8.5    22    16.0
5 19 HG         30    .110   13.39    269    13.532    5806      14      95      38    .057      .8        5     2.2     8    19.0
6 16 HG         34    .140   13.37    585    13.547    7893      21     165     113    .077     1.6       13     8.7    22    16.0
7  3 HG        104   2.690   12.99   1028    15.792   19868     142    6850     431    .113    16.0      775    48.7    81     3.0
8 16 HG         35    .150   13.50    628    13.688    7893      22     175     120    .077     1.7       13     9.3    22    16.0
9 C.T.        1423    .280    7.81     56     9.627    2313     369     136       4    .143    52.8       19      .6     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     4.1       41     6.4
1 IDLE         209    .230   10.60     98    11.056    2132      44      90       6    .232    10.1       21     1.5     0    16.6
2 16 HG         50    .140   13.21    503    13.404    7893      32     167      98    .077     2.4       13     7.6    22    16.0
3 10 HG         54    .180   13.85   1440    14.088   12111      50     313     411    .147     7.4       46    60.4    48    10.0
4 16 HG         36    .160   13.42    580    13.619    7893      23     187     112    .077     1.7       14     8.6    22    16.0
5 19 HG         31    .120   13.46    263    13.613    5806      14     103      37    .057      .8        6     2.1     8    19.0
6 16 HG         34    .150   13.34    594    13.527    7893      21     177     115    .077     1.6       14     8.9    22    16.0
7  3 HG        105   2.730   12.90   1010    15.743   19868     143    6959     423    .113    16.2      786    47.8    81     3.0
8 16 HG         34    .150   13.38    597    13.567    7893      21     176     115    .077     1.6       14     8.9    22    16.0
9 C.T.        1356    .280    7.81     73     9.554    2313     355     137       6    .143    50.7       20      .8     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     4.0       40     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     4.0       38     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     4.0       40     6.3
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(    4.0) + 0.65(    4.0) =    3.999   GM/BHP HR
                                        CO- NDIR 0.35(   37.9) + 0.65(   40.2) =   39.380   GM/BHP HR
                                        NO2-NDIR 0.35(    6.3) + 0.65(    6.3) =    6.317   GM/BHP HR
                                                          CORRECTED NO2 =    6.722   GM/BHP HR
                                                                   BSFC =     .716   LB/BHP HR
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               CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR                MAN.
MODE          HC-FID    CO     CO2  NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE        2142    .170   10.45     48    10.834    2132      42      68       3    .232     9.8       16      .7     0    16.6
2 16 HG        814    .170   13.14    475    13.391    7893      48     202      93    .077     3.7       16     7.2    22    16.0
3 10 HG       1075    .210   13.97   1400    14.287   12111      91     360     394    .147    13.4       53    57.9    48    10.0
4 16 HG        506    .140   13.28    500    13.471    7893      30     166      97    .077     2.3       13     7.5    22    16.0
5 19 HG        309    .120   13.31    260    13.461    5806      13     105      37    .057      .8        6     2.1     8    19.0
6 16 HG        421    .140   13.22    505    13.402    7893      25     167      99    .077     1.9       13     7.6    22    16.0
7  3 HG       2459   2.480   13.05    950    15.776   19868     310    6309     397    .113    35.0      713    44.9    81     3.0
8 16 HG        422    .150   13.35    525    13.542    7893      25     177     102    .077     1.9       14     7.8    22    16.0
9 C.T.       21447    .320    7.88     50    10.345    2313     488     144       4    .143    69.8       21      .5     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.9       37     5.8
1 IDLE        2142    .170   10.45     48    10.834    2132      42      68       3    .232     9.8       16      .7     0    16.6
2 16 HG        618    .150   13.18    450    13.392    7893      36     179      88    .077     2.8       14     6.8    22    16.0
3 10 HG        890    .170   13.86   1363    14.119   12111      76     295     388    .147    11.2       43    57.1    48    10.0
4 16 HG        422    .130   13.31    513    13.482    7893      25     159     100    .077     1.9       12     7.7    22    16.0
5 19 HG        253    .120   13.36    231    13.505    5806      11     104      33    .057      .6        6     1.9     8    19.0
6 16 HG        394    .150   13.32    500    13.509    7893      23     177      97    .077     1.8       14     7.5    22    16.0
7  3 HG       2290   2.660   13.01    975    15.899   19868     286    6715     404    .113    32.3      759    45.7    81     3.0
8 16 HG        349    .140   13.36    555    13.535    7893      20     165     107    .077     1.6       13     8.3    22    16.0
9 C.T.       23270    .330    8.03     50    10.687    2313     509     144       4    .143    72.8       21      .5     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.7       38     5.8
1 IDLE        1403    .230   10.60     63    10.970    2132      27      90       4    .232     6.3       21      .9     0    16.6
2 16 HG        618    .160   13.24    475    13.462    7893      36     190      92    .077     2.8       15     7.1    22    16.0
3 10 HG       1219    .310   14.06   1450    14.492   12111     102     523     402    .147    15.0       77    59.1    48    10.0
4 16 HG        422    .150   13.36    550    13.552    7893      25     176     106    .077     1.9       14     8.2    22    16.0
5 19 HG        253    .110   13.39    250    13.525    5806      11      95      36    .057      .6        5     2.0     8    19.0
6 16 HG        394    .140   13.37    550    13.549    7893      23     165     106    .077     1.8       13     8.2    22    16.0
7  3 HG       2361   2.690   12.99    950    15.966   19868     296    6804     395    .113    33.4      769    44.6    81     3.0
8 16 HG        344    .150   13.50    588    13.684    7893      23     175     113    .077     1.8       13     8.7    22    16.0
9 C.T.       20422    .280    7.81     50    10.132    2313     466     129       4    .143    66.7       18      .5     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.6       40     5.9
1 IDLE        1403    .230   10.60     63    10.970    2132      27      90       4    .232     6.3       21      .9     0    16.6
2 16 HG        696    .140   13.21    475    13.419    7893      38     166      93    .077     2.9       13     7.1    22    16.0
3 10 HG        932    .180   13.85   1375    14.123   12111      80     312     391    .147    11.7       46    57.5    48    10.0
4 16 HG        450    .160   13.42    585    13.625    7893      26     187     101    .077     2.0       14     7.8    22    16.0
5 19 HG        253    .120   13.46    238    13.605    5806      11     103      34    .057      .6        6     1.9     8    19.0
6 16 HG        380    .150   13.34    590    13.528    7893      22     177     107    .077     1.7       14     8.2    22    16.0
7  3 HG       2461   2.730   12.90    948    15.876   19868     308    6901     390    .113    34.8      780    44.0    81     3.0
8 16 HG        344    .150   13.38    563    13.564    7893      23     176     109    .077     1.8       14     8.4    22    16.0
9 C.T.       20637    .280    7.81     44    10.154    2313     470     129       3    .143    67.2       18      .5     0    24.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.5       39     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     5.8       38     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     5.5       40     5.9
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(    5.8) + 0.65(    5.5) =    5.630   GM/BHP HR
                                        CO- NDIR 0.35(   37.5) + 0.65(   39.9) =   39.063   GM/BHP HR
                                        NO2-CL   0.35(    5.8) + 0.65(    5.9) =    5.858   GM/BHP HR
                                                          CORRECTED NO2 =    6.233   GM/BHP HR
                                                                   BSFC =     .716   LB/BHP HR
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                        TABLE C-15.MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-0   TEST 97  RUN 1   1973 STANDARD ENGINE  09-17-73      K =1.059      HUM = 96.9  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2     NO    CARBON    CONS.      HC      CO     NO2     FACT.    HC         CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE       242    .220   10.25     72    10.731    2041       50      85       5     .232    11.5        20    1.1     0   15.5
2 16 HG       77    .180   13.17    541    13.433    7938       49     215     106     .077     3.8        17    8.2    19   16.0
3 10 HG       66    .180   13.78   1340    14.031   11975       61     310     380     .147     8.9        46   55.8    43   10.0
4 16 HG       54    .180   13.29    615    13.528    7938       34     213     120     .077     2.6        16    9.2    19   16.0
5 19 HG       49    .190   13.48    318    13.723    6124       24     171      47     .057     1.3        10    2.7     8   19.0
6 16 HG       49    .190   13.34    614    13.583    7938       31     224     119     .077     2.4        17    9.2    19   16.0
7  3 HG      117   2.770   12.99   1095    15.886   19187      153    6758     439     .113    17.2       764   49.6    76    3.0
8 16 HG       48    .230   13.54    689    13.822    7938       30     267     131     .077     2.3        21   10.1    19   16.0
9 C.T.      1719    .400    7.72     74     9.971    2041      379     165       5     .143    54.2        24     .7     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  4.9        44    7.0
1 IDLE       242    .220   10.25     72    10.731    2041       50      85       5     .232    11.5        20    1.1     0   15.5
2 16 HG       61    .170   13.15    513    13.386    7938       39     204     101     .077     3.0        16    7.8    19   16.0
3 10 HG       50    .150   13.43   1111    13.634   11975       47     266     324     .147     7.0        39   47.6    43   10.0
4 16 HG       43    .160   13.27    601    13.476    7938       27     190     118     .077     2.1        15    9.0    19   16.0
5 19 HG       39    .160   13.58    315    13.782    6124       19     144      46     .057     1.1         8    2.6     8   19.0
6 16 HG       39    .180   13.24    560    13.462    7938       25     214     110     .077     1.9        17    8.4    19   16.0
7  3 HG      112   2.820   13.02   1063    15.961   19187      145    6848     424     .113    16.4       774   47.9    76    3.0
8 16 HG       39    .170   13.36    638    13.572    7938       25     201     124     .077     1.9        15    9.5    19   16.0
9 C.T.      1648    .370    7.83     71     9.980    2041      364     153       5     .143    52.1        22     .7     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  4.6        44    6.4
1 IDLE       158    .230   10.30    113    10.701    2041       33      89       7     .232     7.6        21    1.7     0   15.5
2 16 HG       63    .160   13.10    502    13.328    7938       41     192      99     .077     3.1        15    7.6    19   16.0
3 10 HG       47    .140   13.42   1090    13.611   11975       45     249     318     .147     6.6        37   46.8    43   10.0
4 16 HG       39    .150   13.26    558    13.452    7938       25     179     109     .077     1.9        14    8.4    19   16.0
5 19 HG       36    .140   13.48    295    13.659    6124       17     127      44     .057     1.0         7    2.5     8   19.0
6 16 HG       34    .180   13.26    566    13.477    7938       22     214     111     .077     1.7        16    8.5    19   16.0
7  3 HG       91   2.970   12.92   1011    15.988   19187      118    7200     403     .113    13.3       814   45.5    76    3.0
8 16 HG       33    .160   13.32    622    13.516    7938       21     190     121     .077     1.6        15    9.3    19   16.0
9 C.T.      1678    .360    7.80     69     9.972    2041      371     149       5     .143    53.0        21     .7     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  4.3        45    6.2
1 IDLE       158    .230   10.30    113    10.701    2041       33      89       7     .232     7.6        21    1.7     0   15.5
2 16 HG       46    .160   13.19    517    13.400    7938       29     191     102     .077     2.3        15    7.8    19   16.0
3 10 HG       34    .140   13.53   1187    13.707   11975       32     247     344     .147     4.7        36   50.6    43   10.0
4 16 HG       27    .150   13.33    602    13.509    7938       17     178     117     .077     1.3        14    9.0    19   16.0
5 19 HG       23    .140   13.36    313    13.525    6124       11     128      47     .057      .6         7    2.7     8   19.0
6 16 HG       24    .160   13.35    599    13.536    7938       15     190     117     .077     1.2        15    9.0    19   16.0
7  3 HG       79   2.950   12.89    983    15.925   19187      103    7179     393     .113    11.6       811   44.4    76    3.0
8 16 HG       22    .150   13.45    640    13.624    7938       14     177     124     .077     1.1        14    9.5    19   16.0
9 C.T.      1553    .360    8.07     70    10.107    2041      339     147       5     .143    48.4        21     .7     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  3.7        45    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------  4.8        44    6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------  4.0        45    6.3
FOUR CYCLE COMPOSITE -                HC- NDIR 0.35(     4.8) + 0.65(     4.0) =    4.270   GM/BHP HR
                                      CO- NDIR 0.35(    44.1) + 0.65(    45.4) =   44.901   GM/BHP HR
                                      NO2-NDIR 0.35(     6.7) + 0.65(     6.3) =    6.444   GM/BHP HR
                                                           CORRECTED NO2 =    6.827   GM/BHP HR
                                                                    BSFC =     .783   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE         HC-FID   CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2     FACT.  HC-FID       CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE      4168    .220   10.25     50    10.887    2041       78      83       3     .232    18.1        19     .7     0   15.5
2 16 HG      365    .180   13.17    510    13.387    7938       22     216     100     .077     1.7        17    7.7    19   16.0
3 10 HG      719    .180   13.78   1250    14.032   11975       61     310     354     .147     9.0        46   52.1    43   10.0
4 16 HG      450    .180   13.29    575    13.515    7938       26     214     112     .077     2.0        16    8.6    19   16.0
5 19 HG      278    .190   13.48    275    13.698    6124       12     172      41     .057      .7        10    2.3     8   19.0
6 16 HG      450    .190   13.34    575    13.575    7938       26     224     112     .077     2.0        17    8.6    19   16.0
7  3 HG     2635   2.770   12.99   1000    16.024   19187      316    6700     398     .113    35.7       757   44.9    76    3.0
8 16 HG      451    .230   13.54    625    13.815    7938       26     267     119     .077     2.0        21    9.2    19   16.0
9 C.T.     26663    .400    7.72     45    10.786    2041      505     153       3     .143    72.1        22     .4     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  6.8        44    6.4
1 IDLE      4168    .220   10.25     50    10.887    2041       78      83       3     .232    18.1        19     .7     0   15.5
2 16 HG      590    .170   13.15    475    13.379    7938       35     204      94     .077     2.7        16    7.2    19   16.0
3 10 HG      490    .150   13.43   1050    13.629   11975       43     266     306     .147     6.4        39   45.0    43   10.0
4 16 HG      365    .160   13.27    562    13.467    7938       22     191     110     .077     1.7        15    8.5    19   16.0
5 19 HG      237    .160   13.58    275    13.764    6124       11     144      41     .057      .6         8    2.3     8   19.0
6 16 HG      337    .180   13.24    525    13.454    7938       20     215     103     .077     1.5        17    7.9    19   16.0
7  3 HG     2580   2.820   13.02    975    16.098   19187      307    6789     386     .113    34.7       767   43.6    76    3.0
8 16 HG      285    .170   13.36    600    13.558    7938       17     201     117     .077     1.3        15    9.0    19   16.0
9 C.T.     24529    .370    7.83     35    10.653    2041      470     143       2     .143    67.2        20     .3     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  6.4        43    5.9
1 IDLE      2881    .230   10.30     70    10.818    2041       54      88       4     .232    12.6        20    1.0     0   15.5
2 16 HG      606    .160   13.10    460    13.321    7938       36     193      91     .077     2.8        15    7.0    19   16.0
3 10 HG      450    .140   13.42   1018    13.605   11975       40     249     296     .147     5.8        37   43.5    43   10.0
4 16 HG      337    .150   13.26    532    13.444    7938       20     179     104     .077     1.5        14    8.0    19   16.0
5 19 HG      225    .140   13.48    260    13.643    6124       10     127      39     .057      .6         7    2.2     8   19.0
6 16 HG      304    .180   13.26    507    13.470    7938       18     214      99     .077     1.4        16    7.6    19   16.0
7  3 HG     2581   2.970   12.92    912    16.148   19187      307    7129     360     .113    34.7       806   40.7    76    3.0
8 16 HG      281    .160   13.32    575    13.508    7938       17     190     112     .077     1.3        15    8.6    19   16.0
9 C.T.     24306    .360    7.80     35    10.591    2041      468     140       2     .143    67.0        20     .3     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  6.1        45    5.6
1 IDLE      2881    .230   10.30     70    10.818    2041       54      88       4     .232    12.6        20    1.0     0   15.5
2 16 HG      562    .160   13.19    475    13.406    7938       33     191      93     .077     2.6        15    7.2    19   16.0
3 10 HG      507    .140   13.53   1125    13.721   11975       44     247     326     .147     6.5        36   47.9    43   10.0
4 16 HG      388    .150   13.33    550    13.519    7938       23     178     107     .077     1.8        14    8.3    19   16.0
5 19 HG      236    .140   13.36    275    13.524    6124       11     128      41     .057      .6         7    2.4     8   19.0
6 16 HG      366    .160   13.35    550    13.547    7938       21     189     107     .077     1.6        15    8.2    19   16.0
7  3 HG     2712   2.950   12.89    875    16.111   19187      323    7097     346     .113    36.5       802   39.1    76    3.0
8 16 HG      298    .150   13.45    600    13.630    7938       17     176     116     .077     1.3        14    8.9    19   16.0
9 C.T.     24197    .360    8.07     35    10.848    2041      454     137       2     .143    65.0        20     .3     0   23.9
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------  6.1        45    5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------  6.6        44    6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------  6.1        45    5.7
FOUR CYCLE COMPOSITE -                HC- FID  0.35(     6.6) + 0.65(     6.1) =    6.253   GM/BHP HR
                                      CO- NDIR 0.35(    43.7) + 0.65(    44.9) =   44.446   GM/BHP HR
                                      NO2-CL   0.35(     6.1) + 0.65(     5.7) =    5.887   GM/BHP HR
                                                           CORRECTED NO2 =    6.236   GM/BHP HR
                                                                    BSFC =     .783   LB/BHP HR
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                    TABLEC-16. MASS EMISSIONS BY NINE-MODE FTP
ENGINE-3-0   TEST-47  RUN-2   1973 STANDARD ENGINE  09-17-73      K =1.054     HUM = 94.5  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE        HC      CO     CO2     NO    CARBON   CONS.     HC      CO      NO2    FACT.    HC        CO     NO2     HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE      286    .250   10.45    78    11.009    2041     57      94       5     .232    13.3       22     1.1      0    15.5
2 16 HG      76    .170   13.32   478    13.572    7938     48     201      93     .077     3.7       15     7.1     19    16.0
3 10 HG      61    .150   13.65  1093    13.866   11975     57     262     313     .147     8.4       38    46.1     43    10.0
4 16 HG      53    .160   13.56   546    13.777    7938     33     186     104     .077     2.5       14     8.0     19    16.0
5 19 HG      48    .130   13.56   259    13.742    6124     23     117      38     .057     1.3        7     2.1      8    19.0
6 16 HG      50    .150   13.50   509    13.704    7938     31     176      98     .077     2.4       14     7.5     19    16.0
7  3 HG     122   3.100   13.06   927    16.292   19187    155    7375     362     .113    17.5      833    41.0     76     3.0
8 16 HG      52    .160   13.64   619    13.856    7938     32     195     118     .077     2.5       15     9.1     19    16.0
9 C.T.     1549    .360    8.09    53    10.118    2041    336     147       4     .143    48.1       21      .5      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          4.7       46     5.8
1 IDLE      286    .250   10.45    78    11.009    2041     57      94       5     .232    13.3       22     1.1      0    15.5
2 16 HG      74    .170   13.52   522    13.770    7938     46     198     100     .077     3.5       15     7.7     19    16.0
3 10 HG      58    .150   13.83  1131    14.043   11975     53     258     320     .147     7.8       38    47.1     43    10.0
4 16 HG      54    .160   13.69   618    13.908    7938     33     194     117     .077     2.6       15     9.0     19    16.0
5 19 HG      48    .140   13.73   287    13.922    6124     23     124      42     .057     1.3        7     2.4      8    19.0
6 16 HG      48    .160   13.59   611    13.802    7938     30     186     117     .077     2.3       14     9.0     19    16.0
7  3 HG     102   3.270   12.98   869    16.360   19187    129    7747     338     .113    14.6      875    38.2     76     3.0
8 16 HG      49    .150   13.71   641    13.913    7938     30     173     121     .077     2.3       13     9.3     19    16.0
9 C.T.     1532    .390    8.05    55    10.095    2041    336     140       4     .143    48.1       20      .5      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          4.5       48     5.9
1 IDLE      212    .260   10.45    97    10.939    2041     43      98       6     .232     9.9       23     1.4      0    15.5
2 16 HG      65    .160   13.55   551    13.780    7938     40     186     105     .077     3.1       14     8.1     19    16.0
3 10 HG      56    .150   13.82  1213    14.030   11975     52     259     344     .147     7.6       38    50.5     43    10.0
4 16 HG      49    .150   13.59   605    13.793    7938     30     174     116     .077     2.3       13     8.9     19    16.0
5 19 HG      47    .130   13.75   296    13.931    6124     22     115      43     .057     1.3        7     2.5      8    19.0
6 16 HG      48    .160   13.58   632    13.792    7938     30     186     121     .077     2.3       14     9.3     19    16.0
7  3 HG     103   2.890   13.19   875    16.191   19187    132    6939     345     .113    14.9      784    39.0     76     3.0
8 16 HG      49    .160   13.67   687    13.883    7938     30     185     130     .077     2.3       14    10.0     19    16.0
9 C.T.     1529    .370    7.97    58     9.991    2041    337     153       4     .143    48.2       22      .6      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          4.4       44     6.2
1 IDLE      212    .260   10.45    97    10.939    2041     43      98       6     .232     9.9       23     1.4      0    15.5
2 16 HG      67    .160   13.48   559    13.712    7938     42     187     106     .077     3.2       14     8.2     19    16.0
3 10 HG      56    .140   13.84  1280    14.040   11975     52     241     362     .147     7.6       35    53.3     43    10.0
4 16 HG      51    .150   13.55   644    13.755    7938     32     175     123     .077     2.4       13     9.5     19    16.0
5 19 HG      47    .130   13.70   283    13.881    6124     22     116      41     .057     1.3        7     2.4      8    19.0
6 16 HG      48    .150   13.50   648    13.702    7938     30     176     125     .077     2.3       14     9.6     19    16.0
7  3 HG     103   3.260   12.87   886    16.241   19187    131    7780     348     .113    14.9      879    39.3     76     3.0
8 16 HG      49    .150   13.65   656    13.853    7938     30     174     125     .077     2.3       13     9.6     19    16.0
9 C.T.     1540    .340    7.98    57     9.983    2041    340     140       4     .143    48.6       20      .6      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          4.4       48     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          4.6       47     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          4.4       46     6.3
FOUR CYCLE COMPOSITE -
                                      HC- NDIR 0.35(     4.6) + 0.65(     4.4) =     4.470   GM/BHP HR
                                      CO- NDIR 0.35(    47.4) + 0.65(    46.2) =    46.624   GM/BHP HR
                                      NO2-NDIR 0.35(     5.8) + 0.65(     6.3) =     6.122   GM/BHP HR
                                                             CORRECTED NO2 =     6.451   GM/BHP HR
                                                                      BSFC =      .783   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE       HC-FID    CO    CO2   NO-CL   CARBON   CONS.     HC      CO      NO2    FACT.  HC-FID      CO   NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE     3846    .250   10.45    50    11.085    2041     71      93       3     .232    16.4       22      .7      0    15.5
2 16 HG     591    .170   13.32   450    13.549    7938     35     201      88     .077     2.7       15     6.7     19    16.0
3 10 HG     474    .150   13.65  1063    13.848   11975     41     262     305     .147     6.1       38    44.9     43    10.0
4 16 HG     620    .160   13.56   525    13.782    7938     36     186     100     .077     2.7       14     7.7     19    16.0
5 19 HG     197    .130   13.56   225    13.710    6124      9     117      33     .057      .5        7     1.9      8    19.0
6 16 HG     310    .150   13.50   500    13.681    7938     19     176      96     .077     1.4       14     7.4     19    16.0
7  3 HG    2443   3.100   13.06   875    16.404   19187    286    7324     340     .113    32.3      828    38.4     76     3.0
8 16 HG     310    .160   13.64   553    13.831    7938     18     185     105     .077     1.4       14     8.1     19    16.0
9 C.T.    24366    .360    8.09    13    10.887    2041    457     136       1     .143    65.3       19      .1      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          6.1       46     5.5
1 IDLE     3846    .250   10.45    50    11.085    2041     71      93       3     .232    16.4       22      .7      0    15.5
2 16 HG     620    .170   13.52   500    13.752    7938     36     198      96     .077     2.8       15     7.4     19    16.0
3 10 HG     508    .150   13.83  1000    14.031   11975     43     259     283     .147     6.4       38    41.7     43    10.0
4 16 HG     395    .160   13.69   575    13.889    7938     23     195     109     .077     1.7       15     8.4     19    16.0
5 19 HG     226    .140   13.73   263    13.893    6124     10     125      38     .057      .6        7     2.2      8    19.0
6 16 HG     378    .160   13.59   575    13.788    7938     19     186     110     .077     1.5       14     8.5     19    16.0
7  3 HG    2473   3.270   12.98   838    16.497   19187    288    7682     324     .113    32.5      868    36.6     76     3.0
8 16 HG     310    .150   13.71   625    13.891    7938     18     173     119     .077     1.4       13     9.1     19    16.0
9 C.T.    22345    .390    8.05    13    10.675    2041    437     131       1     .143    62.5       19      .1      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          6.0       48     5.4
1 IDLE     4231    .260   10.45    63    11.133    2041     78      96       4     .232    18.0       22      .9      0    15.5
2 16 HG     592    .160   13.55   500    13.769    7938     34     186      96     .077     2.6       14     7.4     19    16.0
3 10 HG     508    .150   13.82  1175    14.021   11975     43     259     333     .147     6.4       38    49.0     43    10.0
4 16 HG     366    .150   13.59   575    13.777    7938     21     175     110     .077     1.6       13     8.5     19    16.0
5 19 HG     226    .130   13.75   263    13.903    6124     10     116      38     .057      .6        7     2.2      8    19.0
6 16 HG     394    .160   13.58   600    13.779    7938     23     186     115     .077     1.7       14     8.8     19    16.0
7  3 HG    2641   2.890   13.19   875    16.344   19187    311    6874     342     .113    35.1      777    38.7     76     3.0
8 16 HG     338    .160   13.67   650    13.864    7938     19     185     124     .077     1.5       14     9.5     19    16.0
9 C.T.    23913    .370    7.97    13    10.731    2041    455     142       1     .143    65.0       20      .1      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          6.3       44     5.9
1 IDLE     4231    .260   10.45    63    11.133    2041     78      96       4     .232    18.0       22      .9      0    15.5
2 16 HG     648    .160   13.48   513    13.705    7938     38     187      99     .077     2.9       14     7.6     19    16.0
3 10 HG     593    .140   13.84  1250    14.039   11975     51     241     354     .147     7.4       35    52.0     43    10.0
4 16 HG     423    .150   13.55   588    13.742    7938     24     175     113     .077     1.9       13     8.7     19    16.0
5 19 HG     226    .130   13.70   250    13.853    6124     10     116      37     .057      .6        7     2.1      8    19.0
6 16 HG     366    .150   13.50   600    13.687    7938     21     176     116     .077     1.6       14     8.9     19    16.0
7  3 HG    2672   3.260   12.87   800    16.397   19187    313    7706     311     .113    35.3      871    35.1     76     3.0
8 16 HG     338    .150   13.65   625    13.834    7938     19     174     119     .077     1.5       13     9.2     19    16.0
9 C.T.    26278    .340    7.98    13    10.948    2041    490     128       1     .143    70.1       18      .1      0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          6.6       48     5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          6.0       47     5.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          6.4       46     5.9
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(     6.0) + 0.65(     6.4) =     6.305   GM/BHP HR
                                      CO- NDIR 0.35(    47.0) + 0.65(    45.7) =    46.191   GM/BHP HR
                                      NO2-CL   0.35(     5.5) + 0.65(     5.9) =     5.763   GM/BHP HR
                                                             CORRECTED NO2 =     6.073   GM/BHP HR
                                                                      BSFC =      .783   LB/BHP HR
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                          TABLE C-17. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-0   TEST 47  RUN 3   1973 STANDARD ENGINE  09-17-73        K =1.097       HUM =118.6  GR/LB
----------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE          HC       CO    CO2      NO    CARBON   CONS.      HC       CO     NO2    FACT.    HC        CO     NO2     HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        222     .230  10.29      81   10.760    2041      45       88       5    .232    10.6       20     1.2      0    15.5
2 16 HG        57     .170  13.42     541   13.652    7938      36      200     104    .077     2.8       15     8.0     19    16.0
3 10 HG        47     .150  13.88    1265   14.081   11975      43      258     357    .147     6.3       38    52.5     43    10.0
4 16 HG        42     .160  13.70     646   13.905    7938      26      185     122    .077     2.0       14     9.4     19    16.0
5 19 HG        38     .130  13.75     293   13.921    6124      18      116      43    .057     1.0        7     2.4      8    19.0
6 16 HG        40     .160  13.69     607   13.893    7938      25      185     115    .077     1.9       14     8.9     19    16.0
7  3 HG        97    2.990  13.17     941   16.265   19187     124     7125     388    .113    14.0      805    43.9     76     3.0
8 16 HG        40     .160  13.74     643   13.943    7938      25      184     122    .077     1.9       14     9.4     19    16.0
9 C.T.       1729     .350   7.91      62   10.127    2041     376      142       4    .143    53.8       20      .6      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.5       45     6.5
1 IDLE        222     .230  10.29      81   10.760    2041      45       88       5    .232    10.6       20     1.2      0    15.5
2 16 HG        57     .160  13.56     552   13.782    7938      35      196     106    .077     2.7       15     8.1     19    16.0
3 10 HG        47     .150  13.89    1242   14.091   11975      43      258     352    .147     6.4       38    51.7     43    10.0
4 16 HG        42     .160  13.72     640   13.925    7938      26      184     121    .077     2.0       14     9.3     19    16.0
5 19 HG        39     .130  13.77     300   13.942    6124      19      115      44    .057     1.1        7     2.5      8    19.0
6 16 HG        40     .160  13.65     623   13.853    7938      25      185     119    .077     1.9       14     9.1     19    16.0
7  3 HG        97    3.160  13.07     937   16.335   19187     123     7498     365    .113    13.9      847    41.3     76     3.0
8 16 HG        40     .160  13.71     645   13.913    7938      25      184     122    .077     1.9       14     9.4     19    16.0
9 C.T.       1731     .360   7.95      62   10.179    2041     375      146       4    .143    53.6       21      .6      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.5       47     6.3
1 IDLE        248     .200  10.55     106   11.018    2041      50       75       7    .232    11.5       17     1.6      0    15.5
2 16 HG        59     .160  13.59     619   13.814    7938      37      186     118    .077     2.8       14     9.1     19    16.0
3 10 HG        49     .130  13.93    1332   14.113   11975      45      223     375    .147     6.6       33    55.2     43    10.0
4 16 HG        44     .150  13.63     682   13.828    7938      27      174     130    .077     2.1       13    10.0     19    16.0
5 19 HG        41     .130  13.80     300   13.974    6124      19      115      44    .057     1.1        7     2.5      8    19.0
6 16 HG        41     .140  13.60     659   13.784    7938      25      163     126    .077     2.0       13     9.7     19    16.0
7  3 HG        99    3.150  13.05     969   16.307   19187     126     7497     379    .113    14.2      846    42.8     76     3.0
8 16 HG        42     .150  13.71     697   13.905    7938      26      173     132    .077     2.0       13    10.2     19    16.0
9 C.T.       1700     .340   8.66     128   10.836    2041     346      129       8    .143    49.5       18     1.1      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.4       46     6.7
1 IDLE        248     .200  10.55     106   11.018    2041      50       75       7    .232    11.5       17     1.5      0    15.5
2 16 HG        61     .160  13.58     619   13.806    7938      38      186     117    .077     2.9       14     9.0     19    16.0
3 10 HG        50     .160  13.86    1330   14.074   11975      46      275     376    .147     6.8       40    55.2     43    10.0
4 16 HG        44     .160  13.64     660   13.848    7938      27      185     126    .077     2.1       14     9.7     19    16.0
5 19 HG        41     .130  13.81     315   13.984    6124      19      115      46    .057     1.1        7     2.6      8    19.0
6 16 HG        40     .160  13.65     680   13.853    7938      25      185     129    .077     1.9       14    10.0     19    16.0
7  3 HG       100    2.920  13.08    1060   16.108   19187     129     7026     419    .113    14.5      794    47.4     76     3.0
8 16 HG        41     .150  13.73     672   13.924    7938      25      173     127    .077     1.9       13     9.8     19    16.0
9 C.T.       1703     .340   7.96      66   10.139    2041     370      138       4    .143    52.9       20      .6      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.5       44     6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     4.5       46     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     4.4       45     6.8
FOUR CYCLE COMPOSITE =
                                            HC- NDIR 0.35(     4.5) + 0.65(     4.4) =    4.453   GM/BHP HR
                                            CO- NDIR 0.35(    46.0) + 0.65(    45.3) =   45.522   GM/BHP HR
                                            NO2-NDIR 0.35(     6.4) + 0.65(     6.8) =    6.675   GM/BHP HR
                                                                  CORRECTED NO2 =    7.325   GM/BHP HR
                                                                           BSFC =     .783   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE        HC-FID     CO    CO2   NO-CL    CARBON   CONS.      HC       CO     NO2    FACT.  HC-FID      CO   NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE       3841     .230  10.29      53   10.904    2041      72       87       3    .232    16.7       20      .8      0    15.5
2 16 HG       619     .170  13.42     500   13.652    7938      36      200      97    .077     2.8       15     7.4     19    16.0
3 10 HG       565     .150  13.88    1187   14.086   11975      48      258     335    .147     7.1       38    49.2     43    10.0
4 16 HG       412     .160  13.70     587   13.901    7938      24      185     111    .077     1.8       14     8.6     19    16.0
5 19 HG       226     .130  13.75     263   13.903    6124      10      116      38    .057      .6        7     2.2      8    19.0
6 16 HG       423     .160  13.69     562   13.892    7938      24      185     107    .077     1.9       14     8.2     19    16.0
7  3 HG      2586    2.990  13.17     887   16.419   19187     302     7058     349    .113    34.2      798    39.4     76     3.0
8 16 HG       322     .160  13.74     600   13.932    7938      18      184     113    .077     1.4       14     8.7     19    16.0
9 C.T.      25403     .350   7.91      37   10.800    2041     480      134       2    .143    68.6       19      .3      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.4       45     5.9
1 IDLE       3841     .230  10.29      53   10.904    2041      72       87       3    .232    16.7       20      .8      0    15.5
2 16 HG       620     .160  13.56     500   13.782    7938      36      186      96    .077     2.7       14     7.4     19    16.0
3 10 HG       536     .150  13.89    1125   14.094   11975      46      258     318    .147     6.7       38    46.8     43    10.0
4 16 HG       412     .160  13.72     600   13.921    7938      23      184     114    .077     1.8       14     8.7     19    16.0
5 19 HG       226     .130  13.77     262   13.923    6124      10      116      38    .057      .6        7     2.2      8    19.0
6 16 HG       383     .160  13.65     575   13.848    7938      22      185     109    .077     1.7       14     8.4     19    16.0
7  3 HG      2617    3.160  13.07     887   16.492   19187     304     7426     343    .113    34.4      839    38.7     76     3.0
8 16 HG       310     .160  13.71     600   13.901    7938      18      185     114    .077     1.4       14     8.8     19    16.0
9 C.T.      24768     .360   7.95      45   10.787    2041     469      138       3    .143    67.0       20      .4      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.3       47     5.8
1 IDLE       4178     .200  10.55      62   11.168    2041      76       74       4    .232    17.7       17      .9      0    15.5
2 16 HG       648     .160  13.59     562   13.815    7938      37      186     107    .077     2.9       14     8.3     19    16.0
3 10 HG       593     .130  13.93    1262   14.119   11975      50      223     355    .147     7.4       33    52.2     43    10.0
4 16 HG       395     .150  13.63     625   13.819    7938      23      174     119    .077     1.7       13     9.2     19    16.0
5 19 HG       226     .130  13.80     262   13.953    6124      10      115      38    .057      .6        7     2.2      8    19.0
6 16 HG       366     .140  13.60     587   13.777    7938      21      163     112    .077     1.6       13     8.6     19    16.0
7  3 HG      2673    3.150  13.05     887   16.467   19187     311     7416     343    .113    35.2      838    38.8     76     3.0
8 16 HG       327     .150  13.71     625   13.893    7938      19      173     119    .077     1.4       13     9.1     19    16.0
9 C.T.      25565     .340   8.66      40   11.556    2041     452      121       2    .143    64.6       17      .3      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.3       46     6.1
1 IDLE       4178     .200  10.55      62   11.168    2041      76       74       4    .232    17.7       17      .9      0    15.5
2 16 HG       676     .160  13.58     550   13.808    7938      39      186     105    .077     3.0       14     8.1     19    16.0
3 10 HG       565     .160  13.86    1212   14.076   11975      48      275     342    .147     7.1       40    50.3     43    10.0
4 16 HG       395     .160  13.64     600   13.839    7938      23      185     114    .077     1.7       14     8.8     19    16.0
5 19 HG       226     .130  13.81     275   13.963    6124      10      115      40    .057      .6        7     2.3      8    19.0
6 16 HG       395     .160  13.65     600   13.849    7938      23      185     114    .077     1.7       14     8.8     19    16.0
7  3 HG      2629    2.920  13.08     900   16.263   19187     310     6959     353    .113    35.0      786    39.8     76     3.0
8 16 HG       316     .150  13.73     625   13.912    7938      18      173     118    .077     1.4       13     9.1     19    16.0
9 C.T.      25843     .340   7.96      38   10.884    2041     485      129       2    .143    69.3       18      .3      0    23.9
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.5       44     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     6.4       46     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     6.4       45     6.1
FOUR CYCLE COMPOSITE =
                                            HC- FID  0.35(     6.4) + 0.65(     6.4) =    6.397   GM/BHP HR
                                            CO- NDIR 0.35(    45.6) + 0.65(    44.8) =   45.079   GM/BHP HR
                                            NO2-CL   0.35(     5.8) + 0.65(     6.1) =    6.025   GM/BHP HR
                                                                  CORRECTED NO2 =    6.611   GM/BHP HR
                                                                           BSFC =     .783   LB/BHP HR
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TABLE C-18. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 3-1  TEST-69   RUN-1   EGR-CAT-2-AIR            09-7-73       K =1.099      HUM =120.2  GR/LB
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MODE           CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR         MAN.
               HC     CO     CO2     NO     CARBON   CONS.      HC     CO     NO2    FACT.    HC     CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         96    .050    7.52     79    7.679    2359       32     31      8    .232     7.4    7     1.9    0    15.0
2 16 HG        56    .050    8.37    107    8.480    6985       50     83     29    .077     3.8    6     2.3    0    16.0
3 10 HG        43    .050    9.78    309    9.876   11612       55    119    121    .147     8.0   17    17.7   35    10.0
4 16 HG        41    .060    8.26    118    8.369    6985       37    101     33    .077     2.8    8     2.5    0    16.0
5 19 HG        60    .050    7.34     69    7.455    6532       57     88     19    .057     3.2    5     1.1    0    19.0
6 16 HG        41    .040    8.32    118    8.409    6985       37     67     33    .077     2.8    5     2.5    0    16.0
7  3 HG        36    .060   12.61    518   12.709   17781       54    170    241    .113     6.1   19    27.2   68     3.0
8 16 HG        34    .050    8.31    127    8.397    6985       31     84     35    .077     2.4    6     2.7    0    16.0
9 C.T.         72    .050    5.10     51    5.228    2495       37     48      8    .143     5.3    7     1.2    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     2.8    5     3.9
1 IDLE         96    .050    7.52     79    7.679    2359       32     31      8    .232     7.4    7     1.9    0    15.0
2 16 HG        35    .030    8.48    117    8.548    6985       31     50     32    .077     2.4    4     2.4    0    16.0
3 10 HG        33    .020    9.92    347    9.976   11612       41     47    134    .147     6.1    7    19.7   35    10.0
4 16 HG        35    .020    7.73    101    7.788    6985       34     36     30    .077     2.6    3     2.3    0    16.0
5 19 HG        37    .020    7.86     84    7.920    6532       33     33     23    .057     1.9    2     1.3    0    19.0
6 16 HG        31    .030    8.85    128    8.913    6985       26     47     33    .077     2.0    4     2.6    0    16.0
7  3 HG        31    .030   12.54    499   12.603   17781       47     85    231    .113     5.3   10    26.1   68     3.0
8 16 HG        34    .020    8.04    120    8.097    6985       32     35     34    .077     2.4    3     2.6    0    16.0
9 C.T.         59    .020    5.16     45    5.244    2495       30     19      7    .143     4.3    3     1.0    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     2.3    3     3.9
1 IDLE         27    .030    7.82    103    7.879    2359        9     18     10    .232     2.0    4     2.4    0    15.0
2 16 HG        30    .020    8.52    117    8.578    6985       26     33     32    .077     2.0    3     2.4    0    16.0
3 10 HG        31    .020    9.95    341   10.003   11612       39     47    131    .147     5.7    7    19.3   35    10.0
4 16 HG        31    .020    8.11    113    8.163    6985       29     35     32    .077     2.2    3     2.5    0    16.0
5 19 HG        40    .010    7.68     72    7.733    6532       36     17     20    .057     2.1    1     1.2    0    19.0
6 16 HG        31    .010    8.32    119    8.363    6985       28     17     32    .077     2.2    1     2.4    0    16.0
7  3 HG        30    .030   12.68    505   12.742   17781       45     85    234    .113     5.1   10    26.4   68     3.0
8 16 HG        28    .020    8.30    127    8.35[illegible]   6985       25     34     35    .077     1.9    3     2.7    0    16.0
9 C.T.         57    .020    5.10     45    5.[illegible]    2495       30     19      7    .143     4.3    3     1.0    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.8    2     4.0
1 IDLE         27    .030    7.82    103    7.879    2359        9     18     10    .232     2.0    4     2.4    0    15.0
2 16 HG        28    .030    8.45    110    8.510    6985       25     50     30    .077     1.9    4     2.3    0    16.0
3 10 HG        27    .020    9.93    356    9.979   11612       34     47    138    .147     5.0    7    20.2   35    10.0
4 16 HG        26    .020    8.26    122    8.300    6985       24     34     34    .077     1.8    3     2.6    0    16.0
5 19 HG        36    .020    7.55     71    7.609    6532       33     35     20    .057     1.9    2     1.2    0    19.0
6 16 HG        28    .020    8.28    112    8.330    6985       25     34     31    .077     2.0    3     2.4    0    16.0
7  3 HG        27    .030   12.70    490   12.759   17781       41     84    227    .113     4.6   10    25.6   68     3.0
8 16 HG        25    .020    8.30    127    8.347    6985       23     34     35    .077     1.7    3     2.7    0    16.0
9 C.T.         52    .030    5.09     99    5.176    2495       27     29     16    .143     3.9    4     2.3    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.6    3     4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     2.5    4     3.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     1.7    2     4.0
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(      2.5) + 0.65(      1.7) =     1.992   GM/BHP HR
                                  CO- NDIR 0.35(      4.0) + 0.65(      2.4) =     2.946   GM/BHP HR
                                  NO2-NDIR 0.35(      3.9) + 0.65(      4.0) =     3.967   GM/BHP HR
                                                            CORRECTED NO2 =     4.361   GM/BHP HR
                                                                     BSFC =     1.033   LB/BHP HR


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MODE           CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR         MAN.
             HC-FID   CO     CO2   NO-CL    CARBON   CONS.      HC     CO     NO2    FACT.  HC-FID   CO   NO2-CL  HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        210    .050    7.52     48    7.591    2359        7     31      5    .232     1.5    7     1.1    0    15.0
2 16 HG       117    .050    8.37     65    8.432    6985       10     84     18    .077      .7    6     1.4    0    16.0
3 10 HG        58    .050    9.78    270    9.836   11612        7    119    106    .147     1.0   18    15.6   35    10.0
4 16 HG        59    .060    8.26     70    8.325    6985        5    102     19    .077      .3    8     1.5    0    16.0
5 19 HG       253    .050    7.34     30    7.415    6532       22     89      9    .057     1.3    5      .5    0    19.0
6 16 HG        32    .040    8.32     80    8.364    6985        3     67     22    .077      .2    5     1.7    0    16.0
7  3 HG        35    .060   12.61    470   12.673   17781        5    170    219    .113      .5   19    24.7   68     3.0
8 16 HG        27    .050    8.31     80    8.363    6985        2     84     22    .077      .2    6     1.7    0    16.0
9 C.T.        213    .050    5.10     10    5.171    2495       10     49      2    .143     1.5    7      .2    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .5    5     3.2
1 IDLE        210    .050    7.52     48    7.591    2359        7     31      5    .232     1.5    7     1.1    0    15.0
2 16 HG        79    .030    8.48     70    8.517    6985        6     50     19    .077      .5    4     1.5    0    16.0
3 10 HG        45    .020    9.92    320    9.944   11612        6     47    124    .147      .9    7    18.2   35    10.0
4 16 HG        40    .020    7.73     80    7.754    6985        4     36     24    .077      .3    3     1.8    0    16.0
5 19 HG       181    .020    7.86     30    7.898    6532       15     33      8    .057      .9    2      .5    0    19.0
6 16 HG        27    .030    8.85     80    8.883    6985        2     48     21    .077      .2    4     1.6    0    16.0
7  3 HG        46    .030   12.54    460   12.575   17781        6     86    216    .113      .7   10    24.4   68     3.0
8 16 HG        20    .020    8.04     80    8.062    6985        2     35     23    .077      .1    3     1.8    0    16.0
9 C.T.        360    .020    5.16     10    5.216    2495       17     19      2    .143     2.5    3      .2    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .5    3     3.4
1 IDLE         46    .030    7.82     70    7.855    2359        1     18      7    .232      .3    4     1.6    0    15.0
2 16 HG        49    .020    8.52     80    8.547    6985        6     33     22    .077      .4    3     1.7    0    16.0
3 10 HG        37    .020    9.95    380    9.974   11612        4     47    124    .147      .6    7    18.2   35    10.0
4 16 HG        33    .020    8.11     80    8.133    6985        3     35     23    .077      .2    3     1.8    0    16.0
5 19 HG       201    .010    7.68     20    7.710    6532       17     17      6    .057     1.0    1      .3    0    19.0
6 16 HG        41    .010    8.32     80    8.334    6985        3     17     22    .077      .3    1     1.7    0    16.0
7  3 HG        21    .030   12.68    450   12.712   17781        3     85    209    .113      .3   10    23.6   68     3.0
8 16 HG        16    .020    8.30     80    8.322    6985        1     34     22    .077      .1    3     1.7    0    16.0
9 C.T.        378    .020    5.10     10    5.158    2495       18     20      2    .143     2.6    3      .2    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .4    2     3.3
1 IDLE         46    .030    7.82     70    7.855    2359        1     18      7    .232      .3    4     1.6    0    15.0
2 16 HG        56    .030    8.45     70    8.486    6985        5     50     19    .077      .4    4     1.5    0    16.0
3 10 HG        34    .020    9.93    310    9.953   11612        4     47    120    .147      .6    7    17.7   35    10.0
4 16 HG        30    .020    8.26     80    8.283    6985        3     34     22    .077      .2    3     1.7    0    16.0
5 19 HG       191    .020    7.55     30    7.589    6532       11     35      9    .057      .6    2      .5    0    19.0
6 16 HG        43    .020    8.28     80    8.304    6985        4     34     22    .077      .3    3     1.7    0    16.0
7  3 HG        20    .030   12.70    450   12.732   17781        3     85    209    .113      .3   10    23.6   68     3.0
8 16 HG        13    .020    8.30     80    8.321    6985        1     34     22    .077      .1    3     1.7    0    16.0
9 C.T.        320    .030    5.09     20    5.152    2495       16     29      3    .143     2.2    4      .5    0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .3    3     3.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      .5    4     3.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      .4    2     3.3
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(       .5) + 0.65(       .4) =      .400   GM/BHP HR
                                  CO- NDIR 0.35(      4.1) + 0.65(      2.4) =     2.987   GM/BHP HR
                                  NO2-CL   0.35(      3.3) + 0.65(      3.3) =     3.302   GM/BHP HR
                                                            CORRECTED NO2 =     3.630   GM/BHP HR
                                                                     BSFC =     1.033   LB/BHP HR
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TABLE C-19. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 3-1 TEST-84 RUN-2 EGR-CAT-2-AIR 09-07-73 K =1.075 HUM =104.5 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	80	.050	7.51	74	7.646	2359	27	31	8	.232	6.2	7	1.8	0	15.0
2 16 HG	38	.050	8.41	100	8.501	6985	34	83	27	.077	2.6	6	2.1	8	16.0
3 10 HG	30	.040	9.88	331	9.952	11612	38	99	128	.147	5.6	14	18.8	35	10.0
4 16 HG	29	.060	8.28	114	8.371	6985	26	101	32	.077	2.0	8	2.4	8	16.0
5 19 HG	42	.050	7.42	62	7.515	6532	39	88	18	.057	2.2	5	1.0	0	19.0
6 16 HG	29	.060	8.31	111	8.401	6985	26	101	31	.077	2.0	8	2.4	8	16.0
7 3 HG	28	.060	12.60	502	12.690	17781	42	170	234	.113	4.8	19	26.4	68	3.0
8 16 HG	25	.050	8.25	112	8.327	6985	23	86	31	.077	1.7	7	2.4	8	16.0
9 C.T.	63	.060	4.72	42	4.848	2495	35	62	7	.143	5.0	9	1.0	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											2.1	5	3.8		
1 IDLE	80	.050	7.51	74	7.646	2359	27	31	8	.232	6.2	7	1.8	0	15.0
2 16 HG	31	.050	8.47	114	8.553	6985	27	82	31	.077	2.1	6	2.4	8	16.0
3 10 HG	29	.050	9.98	354	10.061	11612	36	117	138	.147	5.3	17	20.2	35	10.0
4 16 HG	28	.040	8.27	121	8.340	6985	25	68	34	.077	2.0	5	2.6	8	16.0
5 19 HG	41	.050	7.54	66	7.634	6532	38	86	19	.057	2.2	5	1.1	0	19.0
6 16 HG	29	.050	8.33	111	8.411	6985	26	89	31	.077	2.0	6	2.4	8	16.0
7 3 HG	28	.060	12.65	491	12.740	17781	42	169	228	.113	4.8	19	25.7	68	3.0
8 16 HG	27	.060	8.37	127	8.459	6985	24	100	35	.077	1.9	8	2.7	8	16.0
9 C.T.	57	.060	5.06	44	5.182	2495	30	58	7	.143	4.2	8	1.0	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											2.0	5	3.9		
1 IDLE	26	.050	7.61	94	7.688	2359	9	31	10	.232	2.0	7	2.2	0	15.0
2 16 HG	30	.050	8.48	115	8.562	6985	26	82	31	.077	2.0	6	2.4	8	16.0
3 10 HG	27	.050	10.22	393	10.299	11612	33	119	147	.147	4.8	17	21.6	35	10.0
4 16 HG	27	.050	8.24	116	8.319	6985	24	85	32	.077	1.9	7	2.5	8	16.0
5 19 HG	39	.050	7.36	61	7.452	6532	37	89	18	.057	2.1	5	1.0	0	19.0
6 16 HG	27	.050	8.30	114	8.379	6985	24	84	32	.077	1.9	6	2.4	8	16.0
7 3 HG	26	.060	12.58	517	12.668	17781	39	170	241	.113	4.5	19	27.2	68	3.0
8 16 HG	25	.060	8.34	131	8.427	6985	22	100	36	.077	1.7	8	2.8	8	16.0
9 C.T.	53	.060	5.05	45	5.167	2495	28	59	7	.143	4.0	8	1.0	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											1.6	5	4.1		
1 IDLE	26	.050	7.61	94	7.688	2359	9	31	10	.232	2.0	7	2.2	0	15.0
2 16 HG	28	.050	8.40	110	8.480	6985	25	83	30	.077	1.9	6	2.3	8	16.0
3 10 HG	26	.050	9.77	317	9.848	11612	33	119	124	.147	4.9	18	18.2	35	10.0
4 16 HG	25	.050	8.35	125	8.427	6985	22	84	34	.077	1.7	6	2.6	8	16.0
5 19 HG	39	.050	7.31	65	7.402	6532	37	89	19	.057	2.1	5	1.1	0	19.0
6 16 HG	27	.040	8.27	113	8.339	6985	24	68	31	.077	1.9	5	2.4	8	16.0
7 3 HG	25	.050	12.64	497	12.717	17781	38	141	231	.113	4.3	16	26.1	68	3.0
8 16 HG	23	.050	8.32	126	8.395	6985	21	84	35	.077	1.6	6	2.7	8	16.0
9 C.T.	51	.050	5.00	46	5.105	2495	27	49	7	.143	3.8	7	1.1	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											1.6	5	3.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											2.1	5	3.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											1.6	5	4.0		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(2.1) + 0.65(1.6) = 1.766 GM/BHP HR
CO- NDIR 0.35(5.4) + 0.65(5.3) = 5.326 GM/BHP HR
NO2-NDIR 0.35(3.9) + 0.65(4.0) = 3.955 GM/BHP HR
CORRECTED NO2 = 4.251 GM/BHP HR
BSFC = 1.033 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	481	.050	7.51	55	7.608	2359	15	31	6	.232	3.5	7	1.3	0	15.0
2 16 HG	144	.050	8.41	70	8.474	6985	12	83	19	.077	.9	6	1.5	8	16.0
3 10 HG	47	.040	9.88	318	9.925	11612	5	95	122	.147	.8	14	18.0	35	10.0
4 16 HG	51	.060	8.28	80	8.345	6985	4	101	22	.077	.3	8	1.7	8	16.0
5 19 HG	186	.050	7.42	30	7.489	6532	16	88	9	.057	.9	5	.5	0	19.0
6 16 HG	57	.060	8.31	75	8.376	6985	5	101	21	.077	.4	8	1.6	8	16.0
7 3 HG	18	.060	12.60	463	12.662	17781	3	170	216	.113	.3	19	24.4	68	3.0
8 16 HG	20	.050	8.25	80	8.302	6985	2	85	22	.077	.1	7	1.7	8	16.0
9 C.T.	456	.060	4.72	20	4.826	2495	24	63	3	.143	3.4	9	.5	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.7	5	3.4		
1 IDLE	481	.050	7.51	55	7.608	2359	15	31	6	.232	3.5	7	1.3	0	15.0
2 16 HG	71	.050	8.47	75	8.527	6985	6	83	20	.077	.4	6	1.6	8	16.0
3 10 HG	34	.050	9.98	320	10.033	11612	4	117	123	.147	.6	17	18.1	35	10.0
4 16 HG	37	.040	8.27	90	8.314	6985	3	68	25	.077	.2	5	1.9	8	16.0
5 19 HG	163	.050	7.54	30	7.606	6532	14	87	9	.057	.8	5	.5	0	19.0
6 16 HG	47	.050	8.33	75	8.385	6985	4	84	21	.077	.3	6	1.6	8	16.0
7 3 HG	18	.060	12.65	440	12.712	17781	3	170	204	.113	.3	19	23.1	68	3.0
8 16 HG	17	.060	8.37	85	8.432	6985	1	100	23	.077	.1	8	1.8	8	16.0
9 C.T.	393	.060	5.06	20	5.159	2495	19	59	3	.143	2.7	8	.5	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.6	5	3.3		
1 IDLE	50	.050	7.61	60	7.665	2359	2	31	6	.232	.4	7	1.4	0	15.0
2 16 HG	60	.050	8.48	75	8.536	6985	5	83	20	.077	.4	6	1.6	8	16.0
3 10 HG	34	.050	10.22	360	10.273	11612	4	119	135	.147	.6	17	19.9	35	10.0
4 16 HG	33	.050	8.24	80	8.293	6985	3	85	22	.077	.2	7	1.7	8	16.0
5 19 HG	174	.050	7.36	30	7.427	6532	15	89	9	.057	.9	5	.5	0	19.0
6 16 HG	45	.050	8.30	80	8.355	6985	4	84	22	.077	.3	7	1.7	8	16.0
7 3 HG	21	.060	12.58	465	12.642	17781	3	170	217	.113	.3	19	24.5	68	3.0
8 16 HG	17	.060	8.34	90	8.402	6985	1	101	25	.077	.1	8	1.9	8	16.0
9 C.T.	373	.060	5.05	20	5.147	2495	18	59	3	.143	2.6	8	.5	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.4	6	3.5		
1 IDLE	50	.050	7.61	60	7.665	2359	2	31	6	.232	.4	7	1.4	0	15.0
2 16 HG	68	.050	8.40	75	8.457	6985	6	83	21	.077	.4	6	1.6	8	16.0
3 10 HG	34	.050	9.77	275	9.823	11612	4	119	108	.147	.6	18	15.9	35	10.0
4 16 HG	33	.050	8.35	88	8.403	6985	3	84	24	.077	.2	6	1.9	8	16.0
5 19 HG	134	.050	7.31	30	7.373	6532	12	89	9	.057	.7	5	.5	0	19.0
6 16 HG	42	.040	8.27	80	8.314	6985	4	68	22	.077	.3	5	1.7	8	16.0
7 3 HG	21	.050	12.64	460	12.692	17781	3	141	214	.113	.3	16	24.2	68	3.0
8 16 HG	17	.050	8.32	90	8.372	6985	1	84	25	.077	.1	6	1.9	8	16.0
9 C.T.	393	.050	5.00	20	5.089	2495	19	50	3	.143	2.8	7	.5	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.4	5	3.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.6	5	3.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.4	5	3.4		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(.6) + 0.65(.4) = .468 GM/BHP HR
CO- NDIR 0.35(5.4) + 0.65(5.3) = 5.342 GM/BHP HR
NO2-CL 0.35(3.3) + 0.65(3.4) = 3.365 GM/BHP HR
CORRECTED NO2 = 3.617 GM/BHP HR
BSFC = 1.033 LB/BHP HR

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                        TABLE C-20. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-1X  TEST-73  RUN-1   EGR-CAT-2-AIR         08-17-73      K =1.028     HUM = 84.6  GR/LB
-----------------------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR            MAN.
MODE            HC      CO     CO2      NO    CARBON   CONS.     HC      CO     NO2    FACT.   HC         CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------------
1 IDLE          17    .070    8.14      67    8.228    2087       5      36       6    .232    1.1         8    1.3     0    16.9
2 16 HG         21    .070    8.91     162    9.003    7348      19     115      44    .077    1.4         9    3.4    15    16.0
3 10 HG  [illegible]  .070   10.90     462   10.997   11658      30     157     170    .147    [illegible] 23   25.0    37    10.0
4 16 HG         22    .070    9.02     198    9.119    7348      19     114      53    .077    [illegible]  9    4.1    15    16.0
5 19 HG         24    .060    8.11     100    8.196    5625      18      83      23    .057    1.0         5    1.3     0    19.0
6 16 HG         24    .070    9.08     189    9.176    7348      21     113      50    .077    1.6         9    3.9    15    16.0
7  3 HG         26    .070   13.03     620   13.128   17917      38     193     281    .113    4.3        22   31.7    67     3.0
8 16 HG         23    .070    9.09     223    9.185    7348      20     113      54    .077    1.5         9    4.6    15    16.0
9 C.T.          54    .060    4.82      30    4.938    1996      24      44       4    .193    3.4         7     .6     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.2         6    4.3
1 IDLE          17    .070    8.14      67    8.228    2087       5      36       6    .232    1.1         8    1.3     0    16.9
2 16 HG         28    .060    8.98     157    9.070    7348      24      98      42    .077    1.9         8    3.3    15    16.0
3 10 HG         31    .060   10.58     517   10.673   11658      37     132     187    .147    5.4        19   27.6    37    10.0
4 16 HG         30    .060    8.97     192    9.062    7348      26      98      52    .077    2.0         8    4.0    15    16.0
5 19 HG         27    .060    8.10      91    8.189    5625      20      83      21    .057    1.1         5    1.2     0    19.0
6 16 HG         29    .060    9.06     192    9.151    7348      25      97      51    .077    1.9         7    3.9    15    16.0
7  3 HG         22    .060   13.06     626   13.144   17917      32     165     283    .113    3.7        19   32.0    67     3.0
8 16 HG         27    .070    9.06     218    9.159    7348      23     113      58    .077    1.8         9    4.5    15    16.0
9 C.T.          46    .060    4.82      28    4.930    1996      20      44       4    .193    2.9         7     .5     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.2         5    4.5
1 IDLE          20    .070    8.28      73    8.372    2087       5      35       6    .232    1.2         8    1.4     0    16.9
2 16 HG         16    .050    9.03     180    9.097    7348      14      82      48    .077    1.1         6    3.7    15    16.0
3 10 HG         27    .060   10.38     493   10.469   11658      32     135     182    .147    4.8        20   26.8    37    10.0
4 16 HG         31    .060    9.00     190    9.093    7348      27      98      51    .077    2.1         8    3.9    15    16.0
5 19 HG         31    .050    8.02      89    8.103    5625      23      70      21    .057    1.3         4    1.2     0    19.0
6 16 HG         32    .050    9.10     201    9.185    7348      28      81      53    .077    2.1         6    4.1    15    16.0
7  3 HG         35    .060   13.12     612   13.218   17917      51     164     275    .113    5.8        19   31.1    67     3.0
8 16 HG         31    .060    8.95     193    9.093    7348      27      98      52    .077    2.1         8    4.0    15    16.0
9 C.T.          50    .060    4.81      43    4.924    1996      22      44       6    .193    3.1         7     .8     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.3         5    4.4
1 IDLE          20    .060    8.28      73    8.362    2087       5      30       6    .232    1.3         7    1.4     0    16.9
2 16 HG         20    .050    8.93     162    9.002    7348      18      82      44    .077    1.4         6    3.4    15    16.0
3 10 HG         21    .060   10.54     520   10.623   11658      25     133     189    .147    3.7        20   27.4    37    10.0
4 16 HG         28    .060    9.01     197    9.100    7348      24      98      53    .077    1.4         8    4.1    15    16.0
5 19 HG         26    .060    8.03      86    8.118    5625      19      84      20    .057    1.1         5    1.1     0    19.0
6 16 HG         25    .060    9.03     190    9.117    7348      22      98      51    .077    1.7         8    3.4    15    16.0
7  3 HG         30    .060   13.20     629   13.292   17917      44     163     281    .113    4.4        18   31.8    67     3.0
8 16 HG         27    .060    9.03     213    9.119    7348      23      98      57    .077    1.8         8    4.4    15    16.0
9 C.T.          42    .050    4.82      29    4.915    1996      18      41       4    .193    2.6         6     .6     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.2         5    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------   1.2         5    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------   1.3         5    4.4
FOUR CYCLE COMPOSITE =
                                    HC- NDIR 0.35(     1.2) + 0.65(     1.3) =    1.235   GM/BHP HR
                                    CO- NDIR 0.35(     5.4) + 0.65(     4.8) =    5.042   GM/BHP HR
                                    NO2-NDIR 0.35(     4.4) + 0.65(     4.4) =    4.423   GM/BHP HR
                                                         CORRECTED NO2 =    4.544   GM/BHP HR
                                                                  BSFC =     .892   LB/BHP HR


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                CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL    CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------------
1 IDLE          79    .070    8.14      45    8.218    2087       2      36       4    .232     .5         8     .4     0    16.9
2 16 HG         75    .070    8.91     140    8.987    7348       6     116      38    .077     .5         9    2.9    15    16.0
3 10 HG         61    .070   10.40     440   10.476   11658       7     157     163    .147    1.0        23   23.9    37    10.0
4 16 HG         48    .070    9.02     120    9.095    7348       4     114      46    .077     .3         9    3.5    15    16.0
5 19 HG         47    .060    8.11      75    8.175    5625       3      83      17    .057     .2         5    1.0     0    19.0
6 16 HG         49    .070    9.08     180    9.155    7348       4     113      48    .077     .3         9    3.7    15    16.0
7  3 HG         38    .070   13.03     590   13.104   17917       5     193     263    .113     .6        22   29.8    67     3.0
8 16 HG         29    .070    9.09     200    9.163    7348       2     113      53    .077     .2         9    4.1    15    16.0
9 C.T.         372    .060    4.82      12    4.917    1996      15      44       2    .193    2.2         7     .2     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .3         6    4.0
1 IDLE          79    .070    8.14      45    8.218    2087       2      36       4    .232     .5         8     .4     0    16.9
2 16 HG         46    .060    8.98     150    9.095    7348       4      98      40    .077     .3         8    3.1    15    16.0
3 10 HG         43    .060   10.58     500   10.694   11658       5     133     182    .147     .7        20   26.7    37    10.0
4 16 HG         35    .060    8.97     175    9.033    7348       3      99      47    .077     .2         8    3.6    15    16.0
5 19 HG         29    .060    8.10      70    8.163    5625       2      84      16    .057     .1         5     .9     0    19.0
6 16 HG         37    .060    9.06     180    9.124    7348       3      98      48    .077     .2         8    3.7    15    16.0
7  3 HG         34    .060   13.06     550   13.123   17917       5     165     249    .113     .5        19   28.2    67     3.0
8 16 HG         24    .070    9.06     190    9.132    7348       2     114      51    .077     .1         9    3.9    15    16.0
9 C.T.         360    .060    4.82      13    4.916    1996      15      44       2    .193    2.1         7     .3     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .3         5    4.1
1 IDLE          33    .070    8.28      55    8.353    2087       1      35       5    .232     .2         8    1.1     0    16.9
2 16 HG         46    .050    9.03     165    9.085    7348       4      82      44    .077     .3         6    3.4    15    16.0
3 10 HG         45    .060   10.38     480   10.444   11658       5     135     178    .147     .7        20   26.1    37    10.0
4 16 HG         34    .060    9.00     180    9.063    7348       3      98      48    .077     .2         8    3.7    15    16.0
5 19 HG         29    .050    8.02      75    8.073    5625       2      70      17    .057     .1         4    1.0     0    19.0
6 16 HG         38    .050    9.10     190    9.154    7348       3      81      51    .077     .2         6    3.9    15    16.0
7  3 HG         34    .060   13.12     590   13.183   17917       5     165     266    .113     .5        19   30.1    67     3.0
8 16 HG         22    .060    8.95     190    9.012    7348       2      99      51    .077     .1         8    4.0    15    16.0
9 C.T.         392    .060    4.81      13    4.909    1996      16      44       2    .193    2.3         7     .3     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .3         5    4.2
1 IDLE          33    .060    8.28      55    8.343    2087       1      30       5    .232     .2         7    1.1     0    16.9
2 16 HG         45    .050    8.93     150    8.985    7348       4      83      41    .077     .3         6    3.1    15    16.0
3 10 HG         46    .060   10.54     500   10.605   11658       5     133     182    .147     .7        20   26.8    37    10.0
4 16 HG         34    .060    9.01     180    9.073    7348       3      98      48    .077     .2         8    3.7    15    16.0
5 19 HG         30    .060    8.03      70    8.093    5625       2      84      16    .057     .1         5     .9     0    19.0
6 16 HG         37    .060    9.03     175    9.094    7348       3      98      47    .077     .2         8    3.6    15    16.0
7  3 HG         34    .060   13.20     590   13.263   17917       5     164     265    .113     .6        19   29.9    67     3.0
8 16 HG         22    .060    9.03     190    9.092    7348       2      98      51    .077     .1         8    3.9    15    16.0
9 C.T.         372    .050    4.82      13    4.907    1996      15      41       2    .193    2.2         6     .3     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .3         5    4.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    .3         5    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    .3         5    4.2
FOUR CYCLE COMPOSITE =
                                    HC- FID  0.35(      .3) + 0.65(      .3) =     .276   GM/BHP HR
                                    CO- NDIR 0.35(     5.4) + 0.65(     4.9) =    5.055   GM/BHP HR
                                    NO2-CL   0.35(     4.0) + 0.65(     4.2) =    4.134   GM/BHP HR
                                                         CORRECTED NO2 =    4.252   GM/BHP HR
                                                                  BSFC =     .892   LB/BHP HR
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                   TABLE C-21. MASS EMISSIONS BY NINE-MODE FTP
ENGINE  3-1X TEST-73  RUN-2   EGR-CAT-2-ATR          08-17-73      K =1.059     HUM = 90.6  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE             HC      CO    CO2     NO    CARBON   CONS.      HC      CO      NO2    FACT.    HC        CO    NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE           36    .090   7.86     63    7.939    2087       10      21       5     .232     2.4        5    1.3     0    16.9
2 16 HG          26    .050   8.70    151    8.778    7348       24      85      42     .077     1.8        7    3.2    15    16.0
3 10 HG          27    .050  10.18    424   10.259   11658       33     115     160     .147     4.9       17   23.5    37    10.0
4 16 HG          32    .040   8.76    188    8.835    7348       24      67      52     .077     2.2        5    4.0    15    16.0
5 19 HG          22    .050   7.84    101    7.924    5625       17      72      24     .057     1.0        4    1.4     0    19.0
6 16 HG          28    .050   8.78    182    8.860    7348       25      84      50     .077     1.9        6    3.9    15    16.0
7  3 HG          20    .070  12.81    615   12.922   17917       30     196     283     .113     3.4       22   32.0    67     3.0
8 16 HG          18    .040   8.73    184    8.784    7348       16      68      52     .077     1.3        5    4.0    15    16.0
9 C.T.           58    .050   4.67     38    4.783    1996       26      42       5     .193     3.7        6     .8     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.3        4    4.2
1 IDLE           36    .090   7.86     63    7.939    2087       10      21       5     .232     2.4        5    1.3     0    16.9
2 16 HG          31    .040   8.83    174    8.903    7348       28      67      48     .077     2.1        5    3.7    15    16.0
3 10 HG          33    .050  10.20    440   10.286   11658       40     119     184     .147     5.9       17   27.1    37    10.0
4 16 HG          39    .050   8.84    198    8.927    7348       30      93      54     .077     2.3        6    4.2    15    16.0
5 19 HG          27    .050   7.77     89    7.849    5625       21      72      21     .057     1.2        4    1.2     0    19.0
6 16 HG          31    .060   8.76    172    8.853    7348       28     101      47     .077     2.1        8    3.6    15    16.0
7  3 HG          30    .060  12.80    601   12.892   17917       45     168     277     .113     5.1       19   31.3    67     3.0
8 16 HG          31    .050   8.84    219    8.923    7348       28      83      60     .077     2.1        6    4.6    15    16.0
9 C.T.           50    .050   4.75     32    4.854    1996       22      42       4     .193     3.2        6     .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.5        4    4.4
1 IDLE           28    .090   8.12     75    8.190    2087        8      21       6     .232     1.8        5    1.5     0    16.9
2 16 HG          21    .050   8.80    173    8.873    7348       19      84      48     .077     1.4        6    3.7    15    16.0
3 10 HG          26    .040  10.21    520   10.278   11658       32      92     196     .147     4.7       13   28.8    37    10.0
4 16 HG          29    .050   8.78    193    8.861    7348       26      84      53     .077     2.0        6    4.1    15    16.0
5 19 HG          30    .040   7.87     98    7.942    5625       23      57      23     .057     1.3        3    1.3     0    19.0
6 16 HG          32    .030   8.81    201    8.875    7348       29      50      55     .077     2.2        4    4.2    15    16.0
7  3 HG          39    .050  12.80    582   12.892   17917       59     140     269     .113     6.6       16   30.3    67     3.0
8 16 HG          34    .040   8.82    213    8.897    7348       30      67      58     .077     2.3        5    4.5    15    16.0
9 C.T.           57    .040   4.74     26    4.842    1996       25      33       4     .193     3.6        5     .5     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.5        4    4.5
1 IDLE           28    .040   8.12     75    8.190    2087        8      21       6     .232     1.8        5    1.5     0    16.9
2 16 HG          31    .050   8.76    169    8.843    7348       28      84      47     .077     2.1        6    3.6    15    16.0
3 10 HG          30    .040  10.20    514   10.272   11658       37      92     194     .147     5.4       13   28.5    37    10.0
4 16 HG          25    .040   8.77    190    8.837    7348       22      67      52     .077     1.7        5    4.0    15    16.0
5 19 HG          20    .040   7.86     86    7.922    5625       15      57      20     .057      .9        3    1.2     0    19.0
6 16 HG          18    .040   8.80    190    8.859    7348       16      67      52     .077     1.2        5    4.0    15    16.0
7  3 HG          28    .050  12.85    583   12.930   17917       42     190     268     .113     4.7       16   30.3    67     3.0
8 16 HG          26    .040   8.87    224    8.938    7348       23      66      61     .077     1.8        5    4.7    15    16.0
9 C.T.           49    .040   4.74     29    4.833    1996       22      33       4     .193     3.1        5     .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.3        4    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     1.4        4    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     1.4        4    4.5
FOUR CYCLE COMPOSITE -             HC- NDIR 0.35(     1.4) + 0.65(     1.4) =    1.395   GM/BHP HR
                                   CO- NDIR 0.35(     4.4) + 0.65(     3.7) =    3.911   GM/BHP HR
                                   NO2-NDIR 0.35(     4.3) + 0.65(     4.5) =    4.430   GM/BHP HR
                                                         CORRECTED NO2 =    4.626   GM/BHP HR
                                                                  BSFC =     .842   LB/BHP HR


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              CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE         HC-FID     CO    CO2   NO-CL    CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID     CO   NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE          117    .040   7.86     40    7.912    2087        3      21       4     .232      .7        5     .8     0    16.9
2 16 HG          76    .050   8.70    130    8.758    7348        6      85      36     .077      .5        7    2.8    15    16.0
3 10 HG          46    .050  10.18    400   10.235   11658        5     115     151     .147      .8       17   22.2    37    10.0
4 16 HG          29    .040   8.76    160    8.803    7348        2      67      44     .077      .2        5    3.4    15    16.0
5 19 HG          25    .050   7.85     75    7.902    5625        2      72      18     .057      .1        4    1.0     0    19.0
6 16 HG          32    .050   8.78    160    8.833    7348        3      84      44     .077      .2        6    3.4    15    16.0
7  3 HG          85    .070  12.83    580   12.902   17917        3     196     267     .113      .4       22   30.2    67     3.0
8 16 HG          12    .040   8.73    170    8.771    7348        1      68      47     .077      .1        5    3.6    15    16.0
9 C.T.          483    .050   4.67     13    4.768    1996       20      42       2     .193     2.9        6     .3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .3        4    3.9
1 IDLE          117    .040   7.86     40    7.912    2087        3      21       4     .232      .7        5     .8     0    16.9
2 16 HG          34    .040   8.83    160    8.873    7348        3      67      44     .077      .2        5    3.4    15    16.0
3 10 HG          31    .050  10.20    450   10.253   11658        3     115     170     .147      .5       17   25.0    37    10.0
4 16 HG          21    .050   8.84    180    8.892    7348        2      83      49     .077      .1        6    3.8    15    16.0
5 19 HG          33    .050   7.77     60    7.823    5625        2      73      14     .057      .1        4     .8     0    19.0
6 16 HG          22    .060   8.76    160    8.822    7348        2     101      44     .077      .1        8    3.4    15    16.0
7  3 HG          18    .060  12.80    560   12.862   17917        2     169     259     .113      .3       19   29.3    67     3.0
8 16 HG          10    .050   8.84    205    8.891    7348        1      83      56     .077      .1        6    4.3    15    16.0
9 C.T.          327    .050   4.75     14    4.833    1996       19      42       2     .193     1.9        6     .3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .2        4    4.1
1 IDLE           17    .040   8.12     55    8.162    2087        0      21       5     .232      .1        5    1.1     0    16.9
2 16 HG          29    .050   8.80    160    8.853    7348        2      84      44     .077      .2        6    3.4    15    16.0
3 10 HG          30    .040  10.21    480   10.253   11658        3      92     181     .147      .5       14   26.6    37    10.0
4 16 HG          18    .050   8.78    175    8.832    7348        2      84      48     .077      .1        6    3.7    15    16.0
5 19 HG          17    .040   7.87     70    7.912    5625        1      57      17     .057      .1        3     .9     0    19.0
6 16 HG          22    .030   8.81    175    8.842    7348        2      50      48     .077      .1        4    3.7    15    16.0
7  3 HG          18    .050  12.80    530   12.852   17917        2     191     245     .113      .3       16   27.7    67     3.0
8 16 HG           4    .040   8.82    200    8.861    7348        1      67      55     .077      .1        5    4.2    15    16.0
9 C.T.          365    .040   4.74     13    4.817    1996       15      33       2     .193     2.2        5     .3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .2        4    4.1
1 IDLE           17    .040   8.12     55    8.162    2087        0      21       5     .232      .1        5    1.1     0    16.9
2 16 HG          30    .050   8.76    150    8.813    7348        3      84      42     .077      .2        6    3.2    15    16.0
3 10 HG          30    .040  10.20    480   10.243   11658        3      92     181     .147      .5       14   26.7    37    10.0
4 16 HG          18    .040   8.77    170    8.812    7348        2      67      47     .077      .1        5    3.6    15    16.0
5 19 HG          15    .040   7.86     75    7.902    5625        1      58      18     .057      .1        3    1.0     0    19.0
6 16 HG          22    .040   8.80    170    8.842    7348        2      67      47     .077      .1        5    3.6    15    16.0
7  3 HG          16    .050  12.85    540   12.902   17917        2     190     244     .113      .2       16   28.1    67     3.0
8 16 HG           4    .040   8.87    200    8.911    7348        1      67      55     .077      .1        5    4.2    15    16.0
9 C.T.          365    .040   4.74     13    4.817    1996       15      33       2     .193     2.2        5     .3     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .2        4    4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      .3        4    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      .2        4    4.1
FOUR CYCLE COMPOSITE -             HC- FID  0.35(      .3) + 0.65(      .2) =     .239   GM/BHP HR
                                   CO- NDIR 0.35(     4.4) + 0.65(     3.7) =    3.923   GM/BHP HR
                                   NO2-CL   0.35(     4.0) + 0.65(     4.1) =    4.097   GM/BHP HR
                                                         CORRECTED NO2 =    4.226   GM/BHP HR
                                                                  BSFC =     .842   LB/BHP HR
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                        TABLEC-22, MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-1X TEST-73   RUN=3   EGR-CAT-2-AIR          08-17-73      K =1.035      HUM = 87.1  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE             HC     CO     CO2     NO    CARBON   CONS.     HC      CO     NO2   FACT.    HC      CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE           37   .040    8.06     62    8.190    2087      10      21       5   .232    2.4      5    1.2     0    16.9
2 16 HG          26   .050    8.75    155    8.828    7348      23      84      43   .077    1.8      6    3.3    15    16.0
3 10 HG          25   .050    9.98    418   10.057   11658      31     117     161   .147    4.6     17   23.6    37    10.0
4 16 HG          23   .050    8.60    173    8.675    7348      21      86      49   .077    1.6      7    3.7    15    16.0
5 19 HG          28   .040    7.86     92    7.930    5625      21      57      22   .057    1.2      3    1.2     0    19.0
6 16 HG          26   .050    8.80    179    8.878    7348      23      84      48   .077    1.8      6    3.7    15    16.0
7  3 HG          22   .050   12.83    695   12.904   17917      33     190     293   .113    3.7     16   33.1    67     3.0
8 16 HG          23   .050    8.84    218    8.915    7348      20      83      60   .077    1.6      6    4.6    15    16.0
9 C.T.           67   .040    4.68     34    4.792    1996      30      34       5   .143    4.3      5     .7     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------    1.3      4    4.3
1 IDLE           37   .040    8.06     62    8.190    2087      10      21       5   .232    2.4      5    1.2     0    16.9
2 16 HG          24   .040    8.73    155    8.796    7348      22      67      43   .077    1.7      5    3.3    15    16.0
3 10 HG          28   .050   10.26    470   10.340   11658      34     119     176   .147    5.0     17   25.9    37    10.0
4 16 HG          25   .050    8.75    184    8.827    7348      22      84      52   .077    1.7      6    4.0    15    16.0
5 19 HG          26   .040    7.95     93    8.018    5625      20      57      22   .057    1.1      3    1.2     0    19.0
6 16 HG          26   .040    8.79    181    8.858    7348      23      67      50   .077    1.8      5    3.8    15    16.0
7  3 HG          28   .050   12.77    601   12.850   17917      42     191     278   .113    4.8     16   31.4    67     3.0
8 16 HG          23   .050    8.83    213    8.905    7348      20      83      58   .077    1.6      6    4.5    15    16.0
9 C.T.           54   .050    4.71     30    4.818    1996      24      42       4   .143    3.5      6     .6     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------    1.3      4    4.3
1 IDLE           26   .040    8.05     75    8.118    2087       7      21       6   .232    1.7      5    1.5     0    16.9
2 16 HG          23   .050    8.83    172    8.905    7348      20      83      47   .077    1.6      6    3.6    15    16.0
3 10 HG          27   .050   10.23    485   10.309   11658      33     114     182   .147    4.8     17   26.8    37    10.0
4 16 HG          33   .050    8.77    186    8.856    7348      30      84      51   .077    2.3      6    3.9    15    16.0
5 19 HG          32   .050    7.94     88    8.025    5625      24      71      20   .057    1.4      4    1.2     0    19.0
6 16 HG          32   .050    8.79    187    8.875    7348      29      84      51   .077    2.2      6    4.0    15    16.0
7  3 HG          31   .060   12.76    591   12.853   17917      47     169     274   .113    5.3     19   30.9    67     3.0
8 16 HG          28   .040    8.78    205    8.850    7348      25      67      57   .077    1.9      5    4.4    15    16.0
9 C.T.           63   .040    4.68     26    4.788    1996      28      34       4   .143    4.1      5     .5     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------    1.4      4    4.4
1 IDLE           26   .040    8.05     75    8.118    2087       7      21       6   .232    1.7      5    1.5     0    16.9
2 16 HG          22   .050    8.75    163    8.824    7348      20      84      45   .077    1.5      6    3.5    15    16.0
3 10 HG          28   .040   10.11    454   10.180   11658      35      93     173   .147    5.1     14   25.4    37    10.0
4 16 HG          31   .040    8.71    186    8.783    7348      28      68      52   .077    2.2      5    4.0    15    16.0
5 19 HG          32   .050    8.01     95    8.095    5625      24      70      22   .057    1.4      4    1.2     0    19.0
6 16 HG          32   .040    8.78    180    8.855    7348      29      67      50   .077    2.2      5    3.8    15    16.0
7  3 HG          31   .060   12.84    592   12.933   17917      46     168     272   .113    5.2     19   30.8    67     3.0
8 16 HG          28   .040    8.90    232    8.970    7348      25      66      63   .077    1.9      5    4.9    15    16.0
9 C.T.           64   .040    4.70     26    4.809    1996      29      34       4   .143    4.1      5     .5     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------    1.4      4    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------    1.3      4    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------    1.4      4    4.3
FOUR CYCLE COMPOSITE -
                                      HC- NDIR 0.35(     1.3) + 0.65(     1.4) =    1.401   GM/BHP HR
                                      CO- NDIR 0.35(     4.0) + 0.65(     4.1) =    4.051   GM/BHP HR
                                      NO2-NDIR 0.35(     4.3) + 0.65(     4.3) =    4.332   GM/BHP HR
                                                           CORRECTED NO2 =    4.485   GM/BHP HR
                                                                    BSFC =     .892   LB/BHP HR


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               CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE          HC-FID    CO     CO2  NO-CL    CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          101   .040    8.06     45    8.110    2087       3      21       4   .232     .6      5     .9     0    16.9
2 16 HG          72   .050    8.75    135    8.807    7348       6      84      37   .077     .5      6    2.9    15    16.0
3 10 HG          46   .050    9.98    395   10.038   11658       5     117     152   .147     .8     17   22.4    37    10.0
4 16 HG          30   .050    8.60    165    8.659    7348       3      86      47   .077     .2      7    3.6    15    16.0
5 19 HG          32   .040    7.86     65    7.903    5625       2      58      15   .057     .1      3     .9     0    19.0
6 16 HG          29   .050    8.80    155    8.853    7348       2      84      43   .077     .2      6    3.3    15    16.0
7  3 HG          22   .050   12.83    595   12.882   17917       3     190     270   .113     .4     16   30.5    67     3.0
8 16 HG          12   .050    8.84    185    8.891    7348       1      83      51   .077     .1      6    3.9    15    16.0
9 C.T.          480   .040    4.68     15    4.768    1996      20      34       2   .143    2.9      5     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     .3      4    3.9
1 IDLE          101   .040    8.06     45    8.110    2087       3      21       4   .232     .6      5     .9     0    16.9
2 16 HG          34   .040    8.73    145    8.773    7348       3      68      40   .077     .2      5    3.1    15    16.0
3 10 HG          33   .050   10.26    445   10.313   11658       4     119     167   .147     .5     17   24.5    37    10.0
4 16 HG          59   .050    8.75    175    8.806    7348       5      84      48   .077     .4      6    3.7    15    16.0
5 19 HG          17   .040    7.95     65    7.992    5625       1      57      15   .057     .1      3     .9     0    19.0
6 16 HG          37   .040    8.79    175    8.834    7348       3      67      48   .077     .2      5    3.7    15    16.0
7  3 HG          18   .050   12.77    570   12.822   17917       3     191     269   .113     .3     16   29.4    67     3.0
8 16 HG          12   .050    8.83    195    8.881    7348       1      84      54   .077     .1      6    4.1    15    16.0
9 C.T.          353   .050    4.71     15    4.795    1996      15      42       2   .143    2.1      6     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     .3      4    4.1
1 IDLE           17   .040    8.05     55    8.092    2087       0      21       5   .232     .1      5    1.1     0    16.9
2 16 HG          32   .050    8.83    160    8.883    7348       3      84      44   .077     .2      6    3.4    15    16.0
3 10 HG          33   .050   10.23    450   10.283   11658       4     115     169   .147     .5     17   24.9    37    10.0
4 16 HG          22   .050    8.77    170    8.822    7348       2      84      47   .077     .1      6    3.6    15    16.0
5 19 HG          19   .050    7.94     70    7.998    5625       1      71      16   .057     .1      4     .9     0    19.0
6 16 HG          22   .050    8.79    165    8.842    7348       2      84      46   .077     .1      6    3.5    15    16.0
7  3 HG          21   .060   12.76    570   12.822   17917       3     169     264   .113     .3     19   29.9    67     3.0
8 16 HG          12   .040    8.78    180    8.821    7348       1      67      50   .077     .1      5    3.8    15    16.0
9 C.T.          411   .040    4.68     20    4.761    1996      17      34       3   .143    2.5      5     .4     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     .2      4    4.1
1 IDLE           17   .040    8.05     55    8.092    2087       0      21       5   .232     .1      5    1.1     0    16.9
2 16 HG          34   .050    8.75    145    8.803    7348       3      84      40   .077     .2      6    3.1    15    16.0
3 10 HG          34   .040   10.11    435   10.159   11658       4      93     166   .147     .6     14   24.4    37    10.0
4 16 HG          24   .040    8.71    170    8.752    7348       2      68      47   .077     .2      5    3.6    15    16.0
5 19 HG          20   .050    8.01     60    8.062    5625       1      70      14   .057     .1      4     .8     0    19.0
6 16 HG          54   .040    8.78    160    8.825    7348       5      67      44   .077     .4      5    3.4    15    16.0
7  3 HG          21   .060   12.84    555   12.902   17917       3     168     256   .113     .3     19   28.9    67     3.0
8 16 HG          13   .040    8.90    205    8.941    7348       1      66      56   .077     .1      5    4.3    15    16.0
9 C.T.          481   .040    4.70     15    4.787    1996      18      34       2   .143    2.5      5     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     .3      4    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------     .3      4    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------     .2      4    4.0
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(      .3) + 0.65(      .2) =     .254   GM/BHP HR
                                      CO- NDIR 0.35(     4.1) + 0.65(     4.1) =    4.063   GM/BHP HR
                                      NO2-CL   0.35(     4.0) + 0.65(     4.0) =    4.019   GM/BHP HR
                                                           CORRECTED NO2 =    4.161   GM/BHP HR
                                                                    BSFC =     .892   LB/BHP HR
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                      TABLEC-23. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-2   TEST 80  RUN 1  EMISSION CONT. SYSTEM  08-28-73      K =1.069     HUM =101.6  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE            HC     CO     CO2      NO    CARBON   CONS.     HC      CO      NO2    FACT.    HC      CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          26   1.700    9.27     32    10.998    3175      8     991       3    .232    1.9     230     .7      0   11.9
2 16 HG         14    .320    8.10     78     8.435    9027     16     692      28    .077    1.2      53    2.1     19   16.0
3 10 HG         18    .360   11.42     47    11.799   13880     23     855      18    .147    3.4     126    2.7     45   10.0
4 16 HG         16    .170    9.98     49    10.167    9027     15     305      14    .077    1.2      23    1.1     19   16.0
5 19 HG         15    .250    9.58     48     9.846    6577     11     337      11    .057     .6      19     .6      9   19.0
6 16 HG         14    .130   10.12     48    10.265    9027     13     231      14    .077    1.0      18    1.1     19   16.0
7  3 HG         16    .170   13.17    115    13.357   20367     26     524      58    .113    3.0      59    6.6     75    3.0
8 16 HG         15    .150   10.42    100    10.586    9027     15     258      28    .077    1.1      20    2.2     19   16.0
9 C.T.          13    .050    6.91     53     6.974    3538      7      51       9    .143    1.0       7    1.3      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .7      26     .9
1 IDLE          26   1.700    9.27     32    10.998    3175      8     991       3    .232    1.9     230     .7      0   11.9
2 16 HG         15    .260   10.39     55    10.666    9027     14     444      15    .077    1.1      34    1.2     19   16.0
3 10 HG         16    .130   11.91     78    12.057   13880     20     302      30    .147    2.9      44    4.4     45   10.0
4 16 HG         15    .190   10.19     51    10.396    9027     14     246      15    .077    1.1      19    1.1     19   16.0
5 19 HG         16    .140    9.62     47     9.777    6577     12     190      10    .057     .7      11     .6      9   19.0
6 16 HG         16    .150   10.49     49    10.657    9027     15     257      12    .077    1.1      20    1.0     19   16.0
7  3 HG         17    .140   13.25    109    13.408   20367     28     430      55    .113    3.2      49    6.2     75    3.0
8 16 HG         15    .130   10.43    101    10.574    9027     14     224      29    .077    1.1      17    2.2     19   16.0
9 C.T.          14    .040    6.99     59     7.045    3538      8      41       9    .143    1.1       6    1.3      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .7      20     .9
1 IDLE          16    .030   10.96     31    11.007    3175      5      17       3    .232    1.2       4     .7      0   11.9
2 16 HG         16    .220   10.71     40    10.947    9027     14     366      11    .077    1.1      28     .8     19   16.0
3 10 HG         17    .130   11.75     58    11.898   13880     21     306      22    .147    3.1      45    3.2     45   10.0
4 16 HG         16    .120   10.15     59    10.287    9027     15     213      17    .077    1.2      16    1.3     19   16.0
5 19 HG         16    .160   10.04     40    10.217    6577     11     208       9    .057     .6      12     .5      9   19.0
6 16 HG         16    .100   10.31     43    10.427    9027     15     175      12    .077    1.2      13    1.0     19   16.0
7  3 HG         16    .120   13.15    112    13.287   20367     26     372      57    .113    3.0      42    6.4     75    3.0
8 16 HG         16    .100   10.48    102    10.597    9027     15     172      29    .077    1.1      13    2.2     19   16.0
9 C.T.          13    .040    6.99     53     7.044    3538      7      41       9    .143    1.0       6    1.3      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .6       9     .8
1 IDLE          16    .030   10.96     31    11.007    3175      5      17       3    .232    1.2       4     .7      0   11.9
2 16 HG         17    .170   10.25     40    10.438    9027     16     297      11    .077    1.2      23     .9     19   16.0
3 10 HG         17    .110   11.90     57    12.028   13880     21     256      22    .147    3.1      38    3.2     45   10.0
4 16 HG         17    .130   10.45     58    10.598    9027     16     224      16    .077    1.2      17    1.3     19   16.0
5 19 HG         17    .150    9.78     40     9.948    6577     12     200       9    .057     .7      11     .5      9   19.0
6 16 HG         17    .110   10.37     48    10.498    9027     16     191      14    .077    1.2      15    1.1     19   16.0
7  3 HG         18    .140   13.78    110    13.939   20367     29     424      55    .113    3.3      48    6.3     75    3.0
8 16 HG         17    .110   10.35     97    10.478    9027     16     191      28    .077    1.2      15    2.1     19   16.0
9 C.T.          14    .030    6.94     50     6.985    3538      8      31       8    .143    1.1       4    1.2      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .7       8     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------      .7      23     .9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------      .7       8     .8
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     .7) + 0.65(     .7) =     .663   GM/BHP HR
                                       CO- NDIR 0.35(   23.4) + 0.65(    8.4) =   13.665   GM/BHP HR
                                       NO2-NDIR 0.35(     .9) + 0.65(     .8) =     .843   GM/BHP HR
                                                              CORRECTED NO2 =     .901   GM/BHP HR
                                                                       BSFC =     .914   LB/BHP HR


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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO      NO2    FACT.  HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        1445   1.700    9.27      2    11.115    3175     41     981       0    .232    9.6     228     .0      0   11.9
2 16 HG        121    .320    8.10     48     8.432    9027     13     692      17    .077    1.0      53    1.3     19   16.0
3 10 HG         69    .360   11.42     17    11.787   13880      8     856       7    .147    1.2     126    1.0     45   10.0
4 16 HG         55    .170    9.98     19    10.155    9027      5     305       6    .077     .4      24     .4     19   16.0
5 19 HG         39    .250    9.58     18     9.834    6577      3     338       4    .057     .1      19     .2      9   19.0
6 16 HG         37    .130   10.12     18    10.254    9027      3     231       5    .077     .3      18     .4     19   16.0
7  3 HG         44    .170   13.17     85    13.344   20367      7     524      43    .113     .8      59    4.9     75    3.0
8 16 HG         37    .150   10.42     70    10.574    9027      3     259      20    .077     .2      20    1.5     19   16.0
9 C.T.          53    .050    6.91     23     6.965    3538      3      51       4    .143     .4       7     .6      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .7      26     .5
1 IDLE        1445   1.700    9.27      2    11.115    3175     41     981       0    .232    9.6     228     .0      0   11.9
2 16 HG         40    .260   10.39     25    10.654    9027      3     445       7    .077     .3      34     .5     19   16.0
3 10 HG         33    .130   11.91     28    12.043   13880      4     303      11    .147     .6      44    1.6     45   10.0
4 16 HG         31    .190   10.19     21    10.383    9027      3     246       6    .077     .2      19     .5     19   16.0
5 19 HG         29    .140    9.62     17     9.763    6577      2     191       4    .057     .1      11     .2      9   19.0
6 16 HG         27    .150   10.49     19    10.643    9027      2     257       4    .077     .2      20     .3     19   16.0
7  3 HG         28    .140   13.25     79    13.393   20367      4     430      40    .113     .5      49    4.5     75    3.0
8 16 HG         23    .130   10.43     21    10.562    9027      2     224      20    .077     .2      17    1.6     19   16.0
9 C.T.          22    .040    6.99     24     7.032    3538      1      41       4    .143     .2       6     .6      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .6      20     .5
1 IDLE          13    .030   10.96      1    10.991    3175      0      18       0    .232     .1       4     .0      0   11.9
2 16 HG         21    .220   10.71     10    10.932    9027      2     367       3    .077     .1      28     .2     19   16.0
3 10 HG         19    .130   11.75     28    11.882   13880      2     307      11    .147     .3      45    1.6     45   10.0
4 16 HG         18    .120   10.15     29    10.272    9027      2     213       9    .077     .1      16     .7     19   16.0
5 19 HG         18    .160   10.04     10    10.202    6577      1     208       2    .057     .1      12     .1      9   19.0
6 16 HG         18    .100   10.31     13    10.412    9027      2     175       4    .077     .1      13     .3     19   16.0
7  3 HG         19    .120   13.15     82    13.272   20367      3     372      42    .113     .3      42    4.7     75    3.0
8 16 HG         15    .100   10.48     72    10.582    9027      1     172      20    .077     .1      13    1.6     19   16.0
9 C.T.          15    .040    6.99     23     7.031    3538      1      41       4    .143     .1       6     .5      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .1       9     .5
1 IDLE          13    .030   10.96      1    10.991    3175      0      18       0    .232     .1       4     .0      0   11.9
2 16 HG         15    .170   10.25     10    10.422    9027      1     297       3    .077     .1      23     .2     19   16.0
3 10 HG         13    .110   11.90     27    12.011   13880      2     257      10    .147     .2      38    1.5     45   10.0
4 16 HG         12    .130   10.45     28    10.581    9027      1     224       8    .077     .1      17     .6     19   16.0
5 19 HG         12    .150    9.78     10     9.931    6577      1     201       2    .057     .0      11     .1      9   19.0
6 16 HG         12    .110   10.37     18    10.481    9027      1     191       5    .077     .1      15     .4     19   16.0
7  3 HG         15    .140   13.28     77    13.421   20367      2     424      39    .113     .3      48    4.4     75    3.0
8 16 HG         12    .110   10.35     67    10.461    9027      1     192      19    .077     .1      15    1.5     19   16.0
9 C.T.          12    .030    6.94     20     6.971    3538      1      31       3    .143     .1       5     .5      0   22.9
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      .0       8     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------      .6      23     .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------      .1       8     .5
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     .6) + 0.65(     .1) =     .250   GM/BHP HR
                                       CO- NDIR 0.35(   23.3) + 0.65(    8.4) =   13.638   GM/BHP HR
                                       NO2-CL   0.35(     .5) + 0.65(     .5) =     .460   GM/BHP HR
                                                              CORRECTED NO2 =     .491   GM/BHP HR
                                                                       BSFC =     .914   LB/BHP HR
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                    TABLEC-24. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-2   TEST 80  RUN 2  EMISSION CONT. SYSTEM  08-24-73      K =1.091     HUM =113.8  GR/LB
=========================================================================================================
               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE          HC       CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC       CO     NO2     HP    VAC.
=========================================================================================================
1 IDLE         47     .120   11.27    31    11.991    3175      14      67      3     .232     3.3      16      .7      0   11.9
2 16 HG        95     .320   10.99    41    11.309    9027      39     516     11     .077     3.0      40      .8     19   16.0
3 10 HG        93     .110   12.78    43    12.936   13880      50     238     15     .147     7.3      35     2.3     45   10.0
4 16 HG        92     .220   10.99    41    11.255    9027      36     356     11     .077     2.8      27      .8     19   16.0
5 19 HG        41     .090   10.09    43    10.179    6577      29     118      9     .057     1.6       7      .5      9   19.0
6 16 HG        39     .170   11.03    49    11.292    9027      34     276     12     .077     2.6      21      .9     19   16.0
7  3 HG        40     .180   14.38    41    14.513   20367      61     425     42     .113     6.9      48     4.8     75    3.0
8 16 HG        39     .160   11.10    51    11.302    9027      34     258     14     .077     2.6      20     1.0     19   16.0
9 C.T.         35     .060    6.58    42     6.618    3538      20      66      7     .143     2.9       9     1.1      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.6      11      .6
1 IDLE         47     .120   11.27    31    11.991    3175      14      67      3     .232     3.3      16      .7      0   11.9
2 16 HG        21     .210   11.71    70    11.993    9027      17     321     18     .077     1.3      25     1.4     19   16.0
3 10 HG        20     .110   12.92    72    12.552   13880      24     246     26     .147     3.5      36     3.9     45   10.0
4 16 HG        20     .130   10.92    70    11.072    9027      18     214     19     .077     1.4      16     1.5     19   16.0
5 19 HG        19     .130   11.28    80    11.931    6577      13     151     15     .057      .7       9      .9      9   19.0
6 16 HG        19     .130   11.99    75    11.791    9027      16     202     19     .077     1.2      16     1.5     19   16.0
7  3 HG        20     .120   13.53   114    13.672   20367      32     361     56     .113     3.6      41     6.4     75    3.0
8 16 HG        19     .120   10.92    79    11.061    9027      17     198     21     .077     1.3      15     1.6     19   16.0
9 C.T.         16     .060    6.64    71     6.717    3538       9      64     12     .143     1.3       9     1.8      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .8       9      .9
1 IDLE         19     .280   11.52   110    11.815    3175       4     152     10     .232      .9      35     2.3      0   11.9
2 16 HG        17     .210   11.92    97    11.648    9027      14     329     25     .077     1.1      25     1.9     19   16.0
3 10 HG        17     .150   11.59   101    11.698   13880      22     360     40     .147     3.2      53     5.8     45   10.0
4 16 HG        16     .190   10.98   101    11.137    9027      14     229     27     .077     1.1      18     2.1     19   16.0
5 19 HG        15     .190   10.98   110    11.136    6577      10     167     22     .057      .5      10     1.2      9   19.0
6 16 HG        15     .130   11.93   107    11.576    9027      13     205     28     .077     1.0      16     2.1     19   16.0
7  3 HG        17     .130   13.59   146    13.738   20367      27     389     72     .113     3.1      44     8.1     75    3.0
8 16 HG        16     .180   11.94   112    11.577    9027      13     189     29     .077     1.0      15     2.2     19   16.0
9 C.T.         13     .060    6.64   102     6.714    3538       7      64     18     .143     1.1       9     2.6      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .6      11     1.3
1 IDLE         19     .280   11.52   110    11.815    3175       4     152     10     .232      .9      35     2.3      0   11.9
2 16 HG        15     .180   11.91   122    12.106    9027      12     271     30     .077      .9      21     2.3     19   16.0
3 10 HG        19     .090   12.86   124    12.965   13880      16     195     46     .147     2.4      29     6.7     45   10.0
4 16 HG        13     .140   11.26   124    11.414    9027      11     224     33     .077      .9      17     2.5     19   16.0
5 19 HG        13     .130   10.64   128    10.784    6577       9     160     26     .057      .5       9     1.5      9   19.0
6 16 HG        13     .120   11.43   126    11.584    9027      11     189     33     .077      .8      15     2.5     19   16.0
7  3 HG        15     .260   14.38   181    14.656   20367      23     730     84     .113     2.5      82     9.4     75    3.0
8 16 HG        13     .110   11.55   124    11.674    9027      11     172     32     .077      .8      13     2.5     19   16.0
9 C.T.         12     .060    6.63   112     6.703    3538       7      64     20     .143     1.0       9     2.8      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .5      11     1.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     1.2      10      .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------      .6      11     1.4
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     1.2) + 0.65(      .6) =     .786   GM/BHP HR
                                    CO- NDIR 0.35(     9.6) + 0.65(    10.8) =   10.372   GM/BHP HR
                                    NO2-NDIR 0.35(      .8) + 0.65(     1.4) =    1.209   GM/BHP HR
                                                          CORRECTED NO2 =    1.318   GM/BHP HR
                                                                   BSFC =     .914   LB/BHP HR


=========================================================================================================
               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE        HC-FID     CO     CO2  NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL     HP    VAC.
=========================================================================================================
1 IDLE         28     .120   11.27     2    11.393    3175       1      68      0     .232      .2      16      .0      0   11.9
2 16 HG        28     .320   10.99     3    11.263    9027       2     518      1     .077      .2      40      .1     19   16.0
3 10 HG        26     .110   12.78    16    12.893   13880       3     234      6     .147      .4      35      .8     45   10.0
4 16 HG        25     .220   10.99     3    11.213    9027       2     358      1     .077      .2      28      .1     19   16.0
5 19 HG        24     .090   10.09     8    10.132    6577       2     118      2     .057      .1       7      .1      9   19.0
6 16 HG        25     .170   11.03     4    11.203    9027       2     277      2     .077      .2      21      .2     19   16.0
7  3 HG        26     .180   14.32    53    14.573   20367       4     426     25     .113      .4      48     2.8     75    3.0
8 16 HG        24     .160   11.10     3    11.262    9027       2     259      1     .077      .1      20      .1     19   16.0
9 C.T.         28     .060    6.52    10     6.583    3538       1      65      2     .143      .2       9      .3      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .1      11      .2
1 IDLE         28     .120   11.27     2    11.393    3175       1      68      0     .232      .2      16      .0      0   11.9
2 16 HG        24     .210   11.71     2    11.922    9027       2     321      1     .077      .1      25      .0     19   16.0
3 10 HG        22     .110   12.42    17    12.532   13880       2     246      6     .147      .4      36      .9     45   10.0
4 16 HG        22     .130   10.92     4    11.052    9027       2     214      1     .077      .1      17      .1     19   16.0
5 19 HG        22     .130   11.28     4    11.912    6577       1     151      2     .057      .1       9      .1      9   19.0
6 16 HG        21     .130   11.59     6    11.722    9027       2     202      2     .077      .1      16      .1     19   16.0
7  3 HG        23     .120   13.53    45    13.652   20367       3     362     28     .113      .4      41     3.1     75    3.0
8 16 HG        21     .120   10.92     5    11.042    9027       2     198      1     .077      .1      15      .1     19   16.0
9 C.T.         21     .060    6.64     4     6.702    3538       1      64      2     .143      .2       9      .2      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .1       9      .2
1 IDLE         18     .280   11.52     3    11.802    3175       0     152      0     .232      .1      35      .1      0   11.9
2 16 HG        21     .210   11.92     7    11.632    9027       2     329      2     .077      .1      25      .1     19   16.0
3 10 HG        21     .150   11.59    36    11.682   13880       3     360     14     .147      .4      53     2.1     45   10.0
4 16 HG        22     .140   10.98     6    11.123    9027       2     230      2     .077      .2      18      .1     19   16.0
5 19 HG        21     .140   10.98    12    11.122    6577       1     167      2     .057      .1      10      .1      9   19.0
6 16 HG        21     .130   11.93     4    11.562    9027       2     205      2     .077      .1      16      .2     19   16.0
7  3 HG        21     .130   13.54    60    13.722   20367       3     390     30     .113      .4      44     3.3     75    3.0
8 16 HG        22     .120   11.94     7    11.562    9027       2     189      2     .077      .1      15      .1     19   16.0
9 C.T.          8     .060    6.64     4     6.701    3538       0      64      2     .143      .0       9      .2      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .1      11      .3
1 IDLE         18     .280   11.52     3    11.802    3175       0     152      0     .232      .1      35      .1      0   11.9
2 16 HG        19     .180   11.91     7    12.092    9027       1     271      2     .077      .1      21      .1     19   16.0
3 10 HG        19     .090   12.86    20    12.952   13880       2     195      7     .147      .3      29     1.0     45   10.0
4 16 HG        18     .140   11.26    16    11.402    9027       1     224      4     .077      .1      17      .3     19   16.0
5 19 HG        19     .130   10.64    16    10.772    6577       1     160      3     .057      .1       9      .2      9   19.0
6 16 HG        18     .120   11.48    17    11.572    9027       1     189      4     .077      .1      15      .3     19   16.0
7  3 HG        22     .260   14.38    58    14.692   20367       3     731     2[illegible]     .113      .3      83     3.0     75    3.0
8 16 HG        19     .110   11.55     7    11.662    9027       1     172      2     .077      .1      13      .1     19   16.0
9 C.T.         18     .060    6.63     4     6.692    3538       1      64      2     .143      .1       9      .2      0   22.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .1      11      .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------      .1      10      .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------      .1      11      .3
FOUR CYCLE COMPOSITE -              HC- FID  0.35(      .1) + 0.65(      .1) =     .075   GM/BHP HR
                                    CO- NDIR 0.35(     9.6) + 0.65(    10.8) =   10.390   GM/BHP HR
                                    NO2-CL   0.35(      .2) + 0.65(      .3) =     .260   GM/BHP HR
                                                          CORRECTED NO2 =     .283   GM/BHP HR
                                                                   BSFC =     .914   LB/BHP HR
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                          TABLE C-25. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-2   TEST 83  RUN=1  EMISSION CONT. SYSTEM  08-30-73      K =1.074      HUM =103.7  GR/LB
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              CONCENTRATION AS MEASURED   TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE          HC      CO     CO2      NO  CARBON   CONS.      HC      CO      NO2  FACT.   HC        CO   NO2   HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE        96   1.890    9.25      80  11.244    3221      30    1094        8   .232   6.9      254   1.8    0    11.6
2 16 HG       24    .220    9.48      86   9.726    8845      24     404       26   .077   1.8       31   2.0   19    16.0
3 10 HG       23    .190   11.33      90  11.545   14243      31     473       37   .147   4.5       70   5.4   45    10.0
4 16 HG       20    .290    9.79      87  10.102    8845      19     513       25   .077   1.5       39   1.9   19    16.0
5 19 HG       20    .200    9.58      55   9.802    6441      14     265       12   .057    .8       15    .7    3    19.0
6 16 HG       20    .210   10.63      59  10.862    8845      18     345       16   .077   1.4       27   1.2   19    16.0
7  3 HG       22    .220   13.97     105  14.214   20412      34     638       50   .113   3.9       72   5.7   74     3.0
8 16 HG       20    .150   10.84      54  11.012    8845      17     243       14   .077   1.3       19   1.1   19    16.0
9 C.T.        19    .080    7.34      84   7.441    3493      10      76       13   .143   1.4       11   1.9    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.1       26   1.0
1 IDLE        96   1.890    9.25      80  11.244    3221      30    1094        8   .232   6.9      254   1.8    0    11.6
2 16 HG       18    .240   10.74      49  10.999    8845      16     390       13   .077   1.2       30   1.0   19    16.0
3 10 HG       19    .090   12.60      55  12.711   14243      23     204       20   .147   3.4       30   3.0   45    10.0
4 16 HG       19    .150   10.73      48  10.901    8845      17     246       13   .077   1.3       19   1.0   19    16.0
5 19 HG       18    .150    9.85      53  10.019    6441      12     195       11   .057    .7       11    .6    3    19.0
6 16 HG       19    .120   10.88      57  11.021    8845      16     195       15   .077   1.3       15   1.2   19    16.0
7  3 HG       21    .150   13.86      87  14.033   20412      33     441       42   .113   3.7       50   4.7   74     3.0
8 16 HG       20    .110   10.81      48  10.942    8845      17     180       13   .077   1.3       14   1.0   19    16.0
9 C.T.        19    .060    6.86      41   6.941    3493      10      61        7   .143   1.5        9   1.0    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.0       21    .7
1 IDLE        19    .420   11.05      36  11.491    3221       6     238        3   .232   1.3       55    .8    0    11.6
2 16 HG       19    .190   10.74      48  10.951    8845      17     310       13   .077   1.3       24   1.0   19    16.0
3 10 HG       19    .090   12.32      49  12.431   14243      24     208       19   .147   3.5       31   2.7   45    10.0
4 16 HG       20    .130   10.75      47  10.902    8845      18     213       13   .077   1.3       16   1.0   19    16.0
5 19 HG       19    .130    9.76      48   9.911    6441      13     171       10   .057    .8       10    .6    3    19.0
6 16 HG       19    .120   10.84      57  10.981    8845      17     195       15   .077   1.3       15   1.2   19    16.0
7  3 HG       20    .160   13.99      85  14.172   20412      31     466       41   .113   3.5       53   4.6   74     3.0
8 16 HG       19    .110   10.82      49  10.951    8845      17     179       13   .077   1.3       14   1.0   19    16.0
9 C.T.        18    .050    6.86      58   6.929    3493      10      51       10   .143   1.4        7   1.4    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .7       11    .7
1 IDLE        19    .040   11.05      36  11.111    3221       6      23        3   .232   1.4        5    .8    0    11.6
2 16 HG       19    .190   10.65      48  10.861    8845      17     313       13   .077   1.3       24   1.0   19    16.0
3 10 HG       19    .090   12.40      49  12.511   14243      23     207       19   .147   3.4       30   2.7   45    10.0
4 16 HG       19    .130   10.71      46  10.861    8845      17     214       12   .077   1.3       16   1.0   19    16.0
5 19 HG       19    .140    9.88      47  10.041    6441      13     181       10   .057    .8       10    .6    3    19.0
6 16 HG       20    .120   11.09      52  11.232    8845      17     191       14   .077   1.3       15   1.0   19    16.0
7  3 HG       21    .170   13.97      81  14.163   20412      33     495       39   .113   3.7       56   4.4   74     3.0
8 16 HG       19    .100   10.99      47  11.111    8845      16     161       12   .077   1.3       12   1.0   19    16.0
9 C.T.        18    .050    7.02      39   7.089    3493      10      50        6   .143   1.4        7    .9    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .8        8    .6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   1.1       23    .9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------    .8       10    .7
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     1.1) + 0.65(     .8) =      .862   GM/BHP HR
                                       CO- NDIR 0.35(    23.1) + 0.65(    9.6) =    14.336   GM/BHP HR
                                       NO2-NDIR 0.35(      .9) + 0.65(     .7) =      .738   GM/BHP HR
                                                            CORRECTED NO2 =      .792   GM/BHP HR
                                                                     BSFC =      .921   LB/BHP HR


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              CONCENTRATION AS MEASURED   TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE         HC-FID   CO     CO2   NO-CL  CARBON   CONS.      HC      CO      NO2  FACT.  HC-FID     CO  NO2-CL HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE      3695   1.890    9.25      15  11.510    3221     103    1068        1   .232  24.0      248    .3    0    11.6
2 16 HG       54    .220    9.48      15   9.705    8845       5     405        5   .077    .4       31    .3   19    16.0
3 10 HG       17    .190   11.33      14  11.522   14243       2     474        6   .147    .3       70    .8   45    10.0
4 16 HG       10    .290    9.79      14  10.081    8845       1     514        4   .077    .1       40    .3   19    16.0
5 19 HG        7    .200    9.58       6   9.781    6441       0     266        1   .057    .0       15    .1    3    19.0
6 16 HG       10    .210   10.63      16  10.841    8845       1     346        4   .077    .1       27    .3   19    16.0
7  3 HG       10    .220   13.97      50  14.191   20412       1     639       24   .113    .2       72   2.7   74     3.0
8 16 HG        3    .150   10.84       4  10.990    8845       0     244        1   .077    .0       19    .1   19    16.0
9 C.T.         9    .080    7.34       7   7.421    3493       0      76        1   .143    .1       11    .2    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.2       25    .2
1 IDLE      3695   1.890    9.25      15  11.510    3221     103    1068        1   .232  24.0      248    .3    0    11.6
2 16 HG        2    .240   10.74       4  10.980    8845       0     391        1   .077    .0       30    .1   19    16.0
3 10 HG        1    .090   12.60      16  12.690   14243       0     204        6   .147    .0       30    .9   45    10.0
4 16 HG        1    .150   10.73       5  10.880    8845       0     246        1   .077    .0       19    .1   19    16.0
5 19 HG        1    .150    9.85       8  10.000    6441       0     195        2   .057    .0       11    .1    3    19.0
6 16 HG        3    .120   10.88      20  11.000    8845       0     195        5   .077    .0       15    .4   19    16.0
7  3 HG        1    .150   13.86      45  14.010   20412       0     441       22   .113    .0       50   2.5   74     3.0
8 16 HG        1    .110   10.81       7  10.920    8845       0     180        2   .077    .0       14    .1   19    16.0
9 C.T.         3    .060    6.86       7   6.920    3493       0      61        1   .143    .0        9    .2    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   1.2       20    .2
1 IDLE         1    .420   11.05       1  11.470    3221       0     238        0   .232    .0       55    .0    0    11.6
2 16 HG        1    .190   10.74       4  10.930    8845       0     311        1   .077    .0       24    .1   19    16.0
3 10 HG        1    .090   12.32      14  12.410   14243       0     209        5   .147    .0       31    .8   45    10.0
4 16 HG        1    .130   10.75       6  10.880    8845       0     213        2   .077    .0       16    .1   19    16.0
5 19 HG        1    .130    9.76       9   9.890    6441       0     171        2   .057    .0       10    .1    3    19.0
6 16 HG        1    .120   10.84      22  10.960    8845       0     196        6   .077    .0       15    .5   19    16.0
7  3 HG        1    .160   13.99      44  14.150   20412       0     466       21   .113    .0       53   2.4   74     3.0
8 16 HG        1    .110   10.82       4  10.930    8845       0     180        1   .077    .0       14    .1   19    16.0
9 C.T.         2    .050    6.86       8   6.910    3493       0      51        1   .143    .0        7    .2    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .0       11    .2
1 IDLE         1    .040   11.05       1  11.090    3221       0      23        0   .232    .0        5    .0    0    11.6
2 16 HG        1    .190   10.65       3  10.840    8845       0     313        1   .077    .0       24    .1   19    16.0
3 10 HG        1    .090   12.40      14  12.490   14243       0     207        5   .147    .0       30    .8   45    10.0
4 16 HG        1    .130   10.71       3  10.840    8845       0     214        1   .077    .0       16    .1   19    16.0
5 19 HG        1    .140    9.88       7  10.020    6441       0     182        1   .057    .0       10    .1    3    19.0
6 16 HG        1    .120   11.09      14  11.210    8845       0     191        4   .077    .0       15    .3   19    16.0
7  3 HG        1    .170   13.97      44  14.140   20412       0     496       21   .113    .0       56   2.4   74     3.0
8 16 HG        1    .100   10.99       4  11.090    8845       0     161        1   .077    .0       12    .1   19    16.0
9 C.T.         1    .050    7.02       8   7.070    3493       0      50        1   .143    .0        7    .2    0    22.9
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    .0        8    .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   1.2       23    .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------    .0       10    .2
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     1.2) + 0.65(     .0) =      .419   GM/BHP HR
                                       CO- NDIR 0.35(    22.9) + 0.65(    9.6) =    14.257   GM/BHP HR
                                       NO2-CL   0.35(      .2) + 0.65(     .2) =      .209   GM/BHP HR
                                                            CORRECTED NO2 =      .225   GM/BHP HR
                                                                     BSFC =      .921   LB/BHP HR
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                    TABLE C-26. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-2   TEST 80  RUN-3  4 DEGREES RET., ECS   08-29-73        K =1.098      HUM =118.9  GR/LB
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MODE         CONCENTRATION AS MEASURED        TOTAL     FUEL     CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
              HC      CO     CO2     NO      CARBON    CONS.     HC      CO     NO2   FACT.    HC       CO    NO2     HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE       112   2.290    8.90     86     11.311     3629      39    1989      9    .232    9.0      399    2.1      0    10.2
2 16 HG       92   2.090    9.83     85     11.965     9253      35    3265     22    .077    2.7      251    1.7     17    16.0
3 10 HG       27    .220   11.90     75     12.149    14339      39     524     29    .147    5.1       77    4.3     41    10.0
4 16 HG       24    .320   10.00     71     10.396     9253      23     578     21    .077    1.8       45    1.6     17    16.0
5 19 HG       24    .250   10.94     70     11.216     7167      17     323     15    .057     .9       18     .8      9    19.0
6 16 HG       24    .210   11.61     71     11.846     9253      20     331     18    .077    1.6       26    1.4     17    16.0
7  3 HG       24    .090   13.13     44     13.246    20689      40     289     49    .113    4.6       32    5.5     67     3.0
8 16 HG       31    .250   10.26     75     10.543     9253      29     443     22    .077    2.3       34    1.7     17    16.0
9 C.T.        55    .370    6.84     74      7.269     9990      37     462     15    .143    5.2       66    2.2      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.7       47    1.1
1 IDLE       112   2.290    8.90     86     11.311     3629      39    1989      9    .232    9.0      399    2.1      0    10.2
2 16 HG       21    .110   12.27     70     12.403     9253      17     166     17    .077    1.3       13    1.3     17    16.0
3 10 HG       22    .070   12.51     75     12.609    14339      27     161     28    .147    4.0       24    4.2     41    10.0
4 16 HG       21    .120   10.75     63     10.893     9253      19     206     18    .077    1.5       16    1.4     17    16.0
5 19 HG       21    .150   10.96     66     11.133     7167      15     195     14    .057     .8       11     .8      9    19.0
6 16 HG       21    .110   11.45     65     11.583     9253      18     178     17    .077    1.4       14    1.3     17    16.0
7  3 HG       23    .160   13.96    113     14.148    20689      36     473     55    .113    4.1       53    6.2     67     3.0
8 16 HG       21    .120   10.96     69     11.103     9253      19     202     18    .077    1.5       16    1.4     17    16.0
9 C.T.        39    .310    6.89     66      7.292     9990      26     388     14    .143    3.7       56    1.9      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.4       29    1.1
1 IDLE        20    .120   11.43     59     11.572     3629       7      76      6    .232    1.6       18    1.3      0    10.2
2 16 HG       22    .120   12.03     67     12.174     9253      18     184     17    .077    1.4       14    1.3     17    16.0
3 10 HG       20    .070   12.66     71     12.752    14339      24     154     26    .147    3.6       23    3.9     41    10.0
4 16 HG       21    .120   11.18     65     11.323     9253      19     190     18    .077    1.4       15    1.4     17    16.0
5 19 HG       21    .140   10.40     62     10.563     7167      15     192     14    .057     .9       11     .8      9    19.0
6 16 HG       20    .100   11.41     62     11.532     9253      17     162     17    .077    1.3       12    1.3     17    16.0
7  3 HG       22    .110   13.51     44     13.644    20689      36     337     50    .113    4.1       38    5.6     67     3.0
8 16 HG       20    .070   11.40     63     11.492     9253      17     114     17    .077    1.3        9    1.3     17    16.0
9 C.T.        34    .260    6.87     65      7.167     9990      23     324     14    .143    3.3       47    1.4      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.0       10    1.0
1 IDLE        20    .120   11.43     59     11.572     3629       7      76      6    .232    1.6       18    1.3      0    10.2
2 16 HG       20    .140   11.54     66     11.782     9253      17     223     17    .077    1.3       17    1.3     17    16.0
3 10 HG       20    .060   13.08     75     13.162    14339      24     132     27    .147    3.5       19    4.0     41    10.0
4 16 HG       20    .110   11.04     64     11.222     9253      18     183     18    .077    1.4       14    1.3     17    16.0
5 19 HG       19    .130   10.50     58     10.651     7167      14     177     13    .057     .8       10     .7      9    19.0
6 16 HG       20    .090   11.37     54     11.482     9253      17     147     14    .077    1.3       11    1.1     17    16.0
7  3 HG       22    .160   14.04    107     14.274    20689      34     468     51    .113    3.9       53    5.8     67     3.0
8 16 HG       20    .070   11.43     60     11.522     9253      17     114     16    .077    1.3        9    1.2     17    16.0
9 C.T.        36    .290    6.84     62      7.214     9990      24     364     13    .143    3.5       52    1.8      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.0       11    1.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    1.6       38    1.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    1.0       10    1.0
FOUR CYCLE COMPOSITE -
                                 HC- NDIR 0.35(    1.6) + 0.65(    1.0) =    1.198   GM/BHP HR
                                 CO- NDIR 0.35(   37.9) + 0.65(   10.3) =   19.978   GM/BHP HR
                                 NO2-NDIR 0.35(    1.1) + 0.65(    1.0) =    1.029   GM/BHP HR
                                                  CORRECTED NO2 =    1.130   GM/BHP HR
                                                           BSFC =    1.068   LB/BHP HR



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MODE         CONCENTRATION AS MEASURED        TOTAL     FUEL     CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
            HC-FID    CO     CO2   NO-CL     CARBON    CONS.     HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL     HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE      2220   2.290    8.90     25     11.412     3629      71    1971      3    .232   16.4      391     .6      0    10.2
2 16 HG      472   2.090    9.83     50     11.967     9253      36    3264     13    .077    2.8      251    1.0     17    16.0
3 10 HG      278    .220   11.90     28     12.198    14339      33     524     11    .147    4.8       77    1.6     41    10.0
4 16 HG        7    .320   10.00     17     10.321     9253       1     580      5    .077     .0       45     .4     17    16.0
5 19 HG        7    .250   10.94     85     11.191     7167       0     323     18    .057     .0       18    1.0      9    19.0
6 16 HG        3    .210   11.61     15     11.820     9253       0     332      4    .077     .0       26     .3     17    16.0
7  3 HG        6    .090   13.13     70     13.221    20689       1     289     36    .113     .1       32    4.1     67     3.0
8 16 HG        2    .250   10.26     16     10.510     9253       0     445      5    .077     .0       34     .4     17    16.0
9 C.T.      1307    .370    6.84      7      7.341     9990      80     457      1    .143   11.4       65     .2      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.4       47     .5
1 IDLE      2220   2.290    8.90     25     11.412     3629      71    1971      3    .232   16.4      391     .6      0    10.2
2 16 HG        3    .110   12.27     16     12.380     9253       0     166      4    .077     .0       13     .3     17    16.0
3 10 HG        2    .070   12.51     34     12.580    14339       0     161     13    .147     .0       24    1.9     41    10.0
4 16 HG        1    .120   10.75     16     10.870     9253       0     206      5    .077     .0       16     .3     17    16.0
5 19 HG        1    .150   10.96      4     11.110     7167       0     195      2    .057     .0       11     .1      9    19.0
6 16 HG        1    .110   11.45     19     11.560     9253       0     178      4    .077     .0       14     .3     17    16.0
7  3 HG        2    .160   13.96     68     14.120    20689       0     473     33    .113     .0       53    3.7     67     3.0
8 16 HG        1    .120   10.96     15     11.080     9253       0     202      4    .077     .0       16     .3     17    16.0
9 C.T.      1333    .310    6.89      6      7.333     9990      82     383      1    .143   11.7       55     .2      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.5       29     .4
1 IDLE        10    .120   11.43      8     11.551     3629       0      76      1    .232     .1       18     .2      0    10.2
2 16 HG       10    .120   12.03     16     12.151     9253       1     185      4    .077     .1       14     .3     17    16.0
3 10 HG        1    .070   12.66     32     12.730    14339       0     154     12    .147     .0       23    1.8     41    10.0
4 16 HG        1    .120   11.18     15     11.300     9253       0     190      4    .077     .0       15     .3     17    16.0
5 19 HG        1    .140   10.40      8     10.540     7167       0     192      2    .057     .0       11     .1      9    19.0
6 16 HG        1    .100   11.41     15     11.510     9253       0     162      4    .077     .0       13     .3     17    16.0
7  3 HG        1    .110   13.51     67     13.620    20689       0     337     34    .113     .0       38    3.8     67     3.0
8 16 HG        1    .070   11.40     14     11.470     9253       0     114      4    .077     .0        9     .3     17    16.0
9 C.T.      1146    .260    6.87      7      7.245     9990      71     326      1    .143   10.2       47     .2      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .5       10     .4
1 IDLE        10    .120   11.43      8     11.551     3629       0      76      1    .232     .1       18     .2      0    10.2
2 16 HG        1    .140   11.54     15     11.730     9253       0     223      4    .077     .0       17     .3     17    16.0
3 10 HG        1    .060   13.08     34     13.140    14339       0     132     12    .147     .0       19    1.8     41    10.0
4 16 HG        1    .110   11.04     16     11.200     9253       0     184      4    .077     .0       14     .3     17    16.0
5 19 HG        1    .130   10.50     10     10.630     7167       0     177      2    .057     .0       10     .1      9    19.0
6 16 HG        1    .090   11.37     15     11.460     9253       0     147      4    .077     .0       11     .3     17    16.0
7  3 HG        6    .160   14.04     66     14.251    20689       1     469     32    .113     .1       53    3.6     67     3.0
8 16 HG        1    .070   11.43     15     11.500     9253       0     114      4    .077     .0        9     .3     17    16.0
9 C.T.      1133    .290    6.84      8      7.243     9990      70     361      2    .143   10.0       52     .2      0    21.5
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .5       11     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    1.7       38     .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     .5       10     .4
FOUR CYCLE COMPOSITE -
                                 HC- FID  0.35(    1.7) + 0.65(     .5) =     .941   GM/BHP HR
                                 CO- NDIR 0.35(   37.8) + 0.65(   10.3) =   19.907   GM/BHP HR
                                 NO2-CL   0.35(     .5) + 0.65(     .4) =     .404   GM/BHP HR
                                                  CORRECTED NO2 =     .444   GM/BHP HR
                                                           BSFC =    1.068   LB/BHP HR
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                     TABLE C-27. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 3-2   TEST 01  RUN-2  LEANER CARB, JETS,ECS 08-29-73     K =1.103     HUM =123.0  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR            MAN.
MODE          HC      CO     CO2      NO   CARBON   CONS.       HC      CO     NO2   FACT.    HC       CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        62   1.750    8.52      79   10.337    3175       21    1086       8   .232    4.8     252    1.8     0    11.1
2 16 HG       25    .820   10.56      65   11.407    8891       21    1291      17   .077    1.6      99    1.3    19    16.0
3 10 HG       25    .330   11.68      65   12.037   13517       30     748      25   .147    4.5     110    3.6    45    10.0
4 16 HG       23    .260   10.26      60   10.545    8891       21     443      17   .077    1.6      34    1.3    19    16.0
5 19 HG       22    .270   10.03      56   10.324    6532       15     345      12   .057     .9      20     .7     3    19.0
6 16 HG       23    .280   10.79      61   11.095    8891       20     453      16   .077    1.5      35    1.2    19    16.0
7  3 HG       23    .100   13.25      97   13.375   19732       37     298      48   .113    4.1      34    5.4    75     3.0
8 16 HG       22    .210   10.84      63   11.074    8891       19     341      17   .077    1.5      26    1.3    19    16.0
9 C.T.        20    .060    6.54      47    6.622    3402       11      62       8   .143    1.6       9    1.1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.0      29     .8
1 IDLE        62   1.750    8.52      79   10.337    3175       21    1086       8   .232    4.8     252    1.8     0    11.1
2 16 HG       21    .370   10.61      61   11.003    8891       18     609      16   .077    1.4      47    1.3    19    16.0
3 10 HG       21    .220   11.80      62   12.043   13517       25     499      23   .147    3.7      73    3.4    45    10.0
4 16 HG       20    .250   10.64      61   10.912    8891       18     411      17   .077    1.4      32    1.3    19    16.0
5 19 HG       19    .180   10.06      53   10.261    6532       13     231      11   .057     .7      13     .6     3    19.0
6 16 HG       21    .220   10.85      58   11.093    8891       18     356      15   .077    1.4      27    1.2    19    16.0
7  3 HG       21    .080   13.41      96   13.513   19732       33     236      47   .113    3.7      27    5.3    75     3.0
8 16 HG       20    .170   10.83      59   11.022    8891       17     277      16   .077    1.3      21    1.2    19    16.0
9 C.T.        19    .050    6.50      44    6.571    3402       11      52       8   .143    1.5       7    1.1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.0      24     .8
1 IDLE        20    .090   10.72      47   10.832    3175        6      53       5   .232    1.5      12    1.1     0    11.1
2 16 HG       20    .330   10.66      57   11.012    8891       17     538      15   .077    1.3      41    1.2    19    16.0
3 10 HG       21    .200   12.01      63   12.233   13517       25     446      23   .147    3.7      66    3.4    45    10.0
4 16 HG       20    .230   10.69      57   10.942    8891       18     378      15   .077    1.4      29    1.2    19    16.0
5 19 HG       20    .150    9.78      51    9.952    6532       14     199      11   .057     .8      11     .6     3    19.0
6 16 HG       20    .220   10.76      53   11.002    8891       17     359      14   .077    1.3      28    1.1    19    16.0
7  3 HG       21    .090   13.61      99   13.723   19732       33     261      47   .113    3.7      30    5.3    75     3.0
8 16 HG       20    .180   10.86      56   11.062    8891       17     292      15   .077    1.3      23    1.2    19    16.0
9 C.T.        19    .050    6.54      44    6.611    3402       11      52       8   .143    1.5       7    1.1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .8      12     .8
1 IDLE        20    .090   10.72      47   10.832    3175        6      53       5   .232    1.5      12    1.1     0    11.1
2 16 HG       20    .330   10.63      56   10.982    8891       17     540      15   .077    1.3      42    1.2    19    16.0
3 10 HG       21    .210   11.94      61   12.173   13517       25     471      22   .147    3.7      69    3.3    45    10.0
4 16 HG       20    .230   10.62      57   10.872    8891       18     380      15   .077    1.4      29    1.2    19    16.0
5 19 HG       19    .110    9.65      48    9.781    6532       14     148      11   .057     .8       8     .6     3    19.0
6 16 HG       21    .200   10.72      55   10.943    8891       18     328      15   .077    1.4      25    1.1    19    16.0
7  3 HG       22    .080   13.53      98   13.634   19732       34     234      47   .113    3.9      26    5.3    75     3.0
8 16 HG       21    .170   10.82      56   11.013    8891       18     277      15   .077    1.4      21    1.2    19    16.0
9 C.T.        19    .050    6.50      44    6.571    3402       11      52       8   .143    1.5       7    1.1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .8      11     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------    1.0      27     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     .8      12     .8
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     1.0) + 0.65(      .8) =      .866   GM/BHP HR
                                       CO- NDIR 0.35(    26.6) + 0.65(    11.6) =    16.848   GM/BHP HR
                                       NO2-NDIR 0.35(      .8) + 0.65(      .8) =      .785   GM/BHP HR
                                                                 CORRECTED NO2 =      .866   GM/BHP HR
                                                                          BSFC =      .896   LB/BHP HR
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              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.       HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE      1319   1.750    8.52       2   10.401    3175       40    1079       0   .232    9.3     250     .0     0    11.1
2 16 HG       62    .820   10.56       6   11.386    8891        8    1293       2   .077     .6     100     .1    19    16.0
3 10 HG       13    .330   11.68      23   12.011   13517        2     748       9   .147     .2     110    1.3    45    10.0
4 16 HG       10    .260   10.26       6   10.521    8891        1     444       2   .077     .1      34     .1    19    16.0
5 19 HG        9    .270   10.03       8   10.301    6532        1     346       2   .057     .0      20     .1     3    19.0
6 16 HG        9    .280   10.79       6   11.071    8891        1     454       2   .077     .1      35     .1    19    16.0
7  3 HG        7    .100   13.25      72   13.351   19732        1     299      35   .113     .1      34    4.0    75     3.0
8 16 HG        7    .210   10.84       7   11.051    8891        1     341       2   .077     .0      26     .1    19    16.0
9 C.T.        13    .060    6.54       8    6.601    3402        1      62       1   .143     .1       9     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .5      29     .3
1 IDLE      1319   1.750    8.52       2   10.401    3175       40    1079       0   .232    9.3     250     .0     0    11.1
2 16 HG       83    .370   10.61       6   10.988    8891        7     605       2   .077     .5      47     .1    19    16.0
3 10 HG        7    .220   11.80      21   12.021   13517        1     500       8   .147     .1      73    1.2    45    10.0
4 16 HG        7    .250   10.64       5   10.891    8891        1     412       1   .077     .0      32     .1    19    16.0
5 19 HG        7    .180   10.06       6   10.241    6532        0     232       1   .057     .0      13     .1     3    19.0
6 16 HG        6    .220   10.85       5   11.071    8891        0     357       1   .077     .0      27     .1    19    16.0
7  3 HG        6    .080   13.41      68   13.491   19732        1     236      33   .113     .1      27    3.7    75     3.0
8 16 HG        6    .170   10.83       5   11.001    8891        0     278       1   .077     .0      21     .1    19    16.0
9 C.T.        27    .050    6.50       6    6.553    3402        1      52       1   .143     .2       7     .1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .5      24     .3
1 IDLE         5    .090   10.72       6   10.811    3175        0      53       1   .232     .0      12     .1     0    11.1
2 16 HG        7    .330   10.66       6   10.991    8891        1     539       2   .077     .0      42     .1    19    16.0
3 10 HG        3    .200   12.01      21   12.210   13517        0     447       8   .147     .1      66    1.1    45    10.0
4 16 HG        3    .230   10.69       5   10.920    8891        0     378       1   .077     .0      29     .1    19    16.0
5 19 HG        3    .150    9.78       5    9.930    6532        0     199       1   .057     .0      11     .1     3    19.0
6 16 HG        3    .220   10.76       4   10.980    8891        0     360       1   .077     .0      28     .1    19    16.0
7  3 HG        3    .090   13.61      65   13.700   19732        0     262      31   .113     .1      30    3.5    75     3.0
8 16 HG        3    .180   10.86       6   11.040    8891        0     293       2   .077     .0      23     .1    19    16.0
9 C.T.         8    .050    6.54       7    6.591    3402        0      52       1   .143     .1       7     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .0      12     .3
1 IDLE         5    .090   10.72       6   10.811    3175        0      53       1   .232     .0      12     .1     0    11.1
2 16 HG        6    .330   10.63       5   10.961    8891        0     541       1   .077     .0      42     .1    19    16.0
3 10 HG        3    .210   11.94      20   12.150   13517        0     472       7   .147     .1      69    1.1    45    10.0
4 16 HG        3    .230   10.62       7   10.850    8891        0     381       2   .077     .0      29     .1    19    16.0
5 19 HG        3    .110    9.65       8    9.760    6532        0     149       2   .057     .0       8     .1     3    19.0
6 16 HG        3    .200   10.72       8   10.920    8891        0     329       2   .077     .0      25     .2    19    16.0
7  3 HG        3    .080   13.53      66   13.610   19732        0     234      32   .113     .1      26    3.6    75     3.0
8 16 HG        3    .170   10.82       5   10.990    8891        0     278       1   .077     .0      21     .1    19    16.0
9 C.T.         8    .050    6.50       8    6.551    3402        0      52       1   .143     .1       7     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .0      11     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     .5      27     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     .0      12     .3
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(      .5) + 0.65(      .0) =      .182   GM/BHP HR
                                       CO- NDIR 0.35(    26.5) + 0.65(    11.6) =    16.847   GM/BHP HR
                                       NO2-CL   0.35(      .3) + 0.65(      .3) =      .268   GM/BHP HR
                                                                 CORRECTED NO2 =      .296   GM/BHP HR
                                                                          BSFC =      .896   LB/BHP HR
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                         TABLE C-28.MASS EMISSIONS BY NINE-MODE FTP
ENGINE-3-2   TEST-82  RUN-1 RICHER CARB. JETS,ECS  08-30-73      K =1.101     HUM =121.6  GR/LB
----------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE           HC      CO     CO2     NO    CARBON   CONS.       HC      CO      NO2   FACT.   HC        CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE         23    .900    8.93     49     9.355    3175        8     274       6   .232
2 16 MG        18    .960   11.09     53    11.569    9526       16     765      14   .077    2.0       64    1.3     0   10.2
3 10 MG        17    .080   13.61     58    13.708   15105       20     178      21   .147    1.2       59    1.1    17   16.0
4 16 MG        16    .190   11.25     51    11.957    9526       19     319      19   .077    3.0       26    3.1    44   10.0
5 19 MG        16    .260   10.91     48    10.687    6895       11     339      10   .057    1.1       25    1.1    17   16.0
6 16 MG        17    .130   11.80     46    11.998    9526       15     209      12   .077     .6       19     .6     1   19.0
7  3 MG        19    .970   14.71    110    15.701   22181       29    2768      52   .113    1.1       16     .9    17   16.0
8 16 MG        16    .070   11.93     46    12.017    9526       19     112      12   .077    3.3      313    5.8    73    3.0
9 C.T.         15    .060    6.67     39     6.746    3679        9      66       6   .143    1.1        9     .9    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   1.3        9     .9     0   22.1
1 IDLE         23    .900    8.93     49     9.358    3175        8     274       6   .232     .7       27     .6
2 16 MG        18    .150   12.09     46    12.209    9526       15     236      12   .077    2.0       64    1.3     0   10.2
3 10 MG        18    .080   12.95     47    13.099   15105       23     187      18   .147    1.2       18     .9    17   16.0
4 16 MG        17    .170   10.79     47    10.978    9526       16     298      14   .077    3.3       27    2.7    44   10.0
5 19 MG        17    .170   10.99     45    11.178    6895       11     212       9   .057    1.2       23    1.0    17   16.0
6 16 MG        18    .110   11.69     42    11.819    9526       16     179      11   .077     .6       12     .5     1   19.0
7  3 MG        21    .930   14.75    106    15.703   22181       32    2659      50   .113    1.2       14     .9    17   16.0
8 16 MG        18    .120   11.35     44    11.489    9526       16     201      12   .077    3.6      300    5.6    73    3.0
9 C.T.         16    .050    6.63     31     6.697    3679        9      55       6   .143    1.2       15     .9    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   1.4        8     .8     0   22.1
1 IDLE         18    .090    9.48     39     9.589    3175        6      60       9   .232     .8       24     .7
2 16 MG        19    .230   11.51     44    11.759    9526       16     376      12   .077    1.5       14    1.0     0   10.2
3 10 MG        18    .070   13.37     44    13.459   15105       22     159      18   .147    1.2       29     .9    17   16.0
4 16 MG        18    .160   11.13     44    11.309    9526       16     272      12   .077    3.2       23    2.7    44   10.0
5 19 MG        17    .200   10.33     42    10.548    6895       12     264       9   .057    1.3       21     .9    17   16.0
6 16 MG        18    .120   11.72     40    11.859    9526       16     196      11   .077     .7       15     .5     1   19.0
7  3 MG        22    .830   14.79    105    15.644   22181       34    2377      44   .113    1.2       15     .8    17   16.0
8 16 MG        19    .080   11.75     42    11.851    9526       16     130      11   .077    3.8      269    5.6    73    3.0
9 C.T.         17    .050    6.71     30     6.778    3679       10      55       5   .143    1.3       10     .9    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   1.4        8     .8     0   22.1
1 IDLE         18    .090    9.48     39     9.589    3175        6      60       9   .232     .8       20     .7
2 16 MG        19    .210   11.47     43    11.701    9526       17     345      12   .077    1.5       14    1.0     0   10.2
3 10 MG        20    .080   13.77     50    13.872   15105       24     176      18   .147    1.3       27     .9    17   16.0
4 16 MG        18    .120   11.49     42    11.629    9526       16     199      11   .077    3.5       26    2.7    44   10.0
5 19 MG        19    .190   10.51     42    10.721    6895       13     247       9   .057    1.2       15     .9    17   16.0
6 16 MG        19    .080   11.79     41    11.891    9526       16     129      11   .077     .8       14     .5     1   19.0
7  3 MG        22    .880   14.74    107    15.644   22181       34    2520      50   .113    1.3       10     .8    17   16.0
8 16 MG        19    .080   11.75     43    11.851    9526       16     130      11   .077    3.8      285    5.7    73    3.0
9 C.T.         17    .060    6.68     30     6.760    3679       10      66       5   .143    1.3       10     .9    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   1.4        9     .8     0   22.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     .8       20     .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     .8       25     .8
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(      .8) + 0.65(      .8) =     .772   GM/BHP HR    .8  20  .7
                                        CO- NDIR 0.35(    25.3) + 0.65(    20.2) =   21.979   GM/BHP HR
                                        NO2-NDIR 0.35(      .8) + 0.65(      .7) =     .719   GM/BHP HR
                                                               CORRECTED NO2 =     .792   GM/BHP HR
                                                                        BSFC =    1.019   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE         HC-FID    CO     CO2  NO-CL    CARBON   CONS.       HC      CO      NO2   FACT.  HC-FID     CO  NO2-CL  HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        278    .900    8.93     15     9.358    3175        9     274       2   .232
2 16 MG        34    .960   11.09     15    11.553    9526        3     766       4   .077    2.2       64     .4     0   10.2
3 10 MG        30    .080   13.61     31    13.693   15105        3     178      11   .147     .2       59     .3    17   16.0
4 16 MG        28    .190   11.28     19    11.493    9526        2     320       4   .077     .5       26    1.7    44   10.0
5 19 MG        27    .260   10.91      9    10.673    6895        2     339       1   .057     .2       25     .3    17   16.0
6 16 MG        28    .130   11.80      6    11.933    9526        2     210       2   .077     .1       19     .0     1   19.0
7  3 MG        82    .970   14.71     60    15.688   22181       12    2770      28   .113     .2       16     .1    17   16.0
8 16 MG        28    .070   11.93     16    12.003    9526        2     112       4   .077    1.3      313    3.2    73    3.0
9 C.T.         47    .060    6.67      8     6.735    3679        3      66       1   .143     .2        9     .3    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    .4        9     .2     0   22.1
1 IDLE        278    .900    8.93     15     9.358    3175        9     274       2   .232     .3       27     .3
2 16 MG        26    .150   12.09      7    12.193    9526        2     237       2   .077    2.2       64     .4     0   10.2
3 10 MG        22    .080   12.95     28    13.032   15105        3     187      11   .147     .2       18     .1    17   16.0
4 16 MG        22    .170   10.79     12    10.962    9526        2     298       3   .077     .4       28    1.6    44   10.0
5 19 MG        22    .170   10.99      4    11.162    6895        1     212       1   .057     .1       23     .3    17   16.0
6 16 MG        22    .110   11.69     10    11.802    9526        2     179       3   .077     .1       12     .0     1   19.0
7  3 MG        71    .930   14.78     60    15.687   22181       10    2656      28   .113     .1       14     .2    17   16.0
8 16 MG        22    .120   11.38     12    11.472    9526        2     201       3   .077    1.1      300    3.2    73    3.0
9 C.T.         24    .050    6.63      8     6.682    3679        1      56       1   .143     .1       15     .3    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    .2        8     .2     0   22.1
1 IDLE         21    .090    9.48     22     9.572    3175        1      60       2   .232     .2       24     .3
2 16 MG        22    .230   11.51     10    11.742    9526        2     377       3   .077     .2       14     .6     0   10.2
3 10 MG        21    .070   13.37     27    13.442   15105        2     159      10   .147     .1       29     .2    17   16.0
4 16 MG        21    .160   11.13     11    11.292    9526        2     273       3   .077     .4       23    1.5    44   10.0
5 19 MG        21    .200   10.33      9    10.532    6895        1     264       1   .057     .1       21     .2    17   16.0
6 16 MG        21    .120   11.72      9    11.842    9526        2     195       2   .077     .1       15     .0     1   19.0
7  3 MG        68    .830   14.79     60    15.627   22181       10    2380      28   .113     .1       15     .2    17   16.0
8 16 MG        21    .080   11.75      9    11.832    9526        2     130       2   .077    1.1      269    3.2    73    3.0
9 C.T.         21    .050    6.71      8     6.762    3679        1      55       1   .143     .1       10     .2    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    .2        8     .2     0   22.1
1 IDLE         21    .090    9.48     22     9.572    3175        1      60       2   .232     .1       20     .3
2 16 MG        21    .210   11.47     10    11.682    9526        2     346       3   .077     .2       14     .6     0   10.2
3 10 MG        19    .080   13.77     27    13.852   15105        2     176      10   .147     .1       27     .2    17   16.0
4 16 MG        19    .120   11.49     13    11.612    9526        2     199       4   .077     .3       26    1.4    44   10.0
5 19 MG        19    .190   10.51     17    10.702    6895        1     247       4   .057     .1       15     .3    17   16.0
6 16 MG        19    .080   11.79     10    11.872    9526        2     130       3   .077     .1       14     .2     1   19.0
7  3 MG        66    .880   14.74     61    15.627   22181        9    2523      29   .113     .1       10     .2    17   16.0
8 16 MG        19    .080   11.75     14    11.832    9526        2     130       4   .077    1.1      285    3.2    73    3.0
9 C.T.         21    .060    6.68      9     6.742    3679        1      66       2   .143     .1       10     .3    17   16.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------    .2        9     .2     0   22.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     .1       20     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     .2       25     .3
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      .2) + 0.65(      .1) =     .159   GM/BHP HR    .1  20  .3
                                        CO- NDIR 0.35(    25.3) + 0.65(    20.2) =   22.003   GM/BHP HR
                                        NO2-CL   0.35(      .3) + 0.65(      .3) =     .321   GM/BHP HR
                                                               CORRECTED NO2 =     .353   GM/BHP HR
                                                                        BSFC =    1.019   LB/BHP HR
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TABLE C-29. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 3-2   TEST-86 RUN-1-MODALLY OPTIMIZED,ECS   09-03-73   K =1.066   HUM =100.1 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	19	.020	12.95	29	12.991	3175	5	10	2	.232	1.2	2	.5	0	11.5
2 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
3 10 HG	19	.030	13.58	30	13.631	19062	21	63	10	.197	3.1	9	1.5	95	10.0
4 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
5 19 HG	19	.030	7.04	36	7.089	6577	19	56	11	.057	.8	3	.6	9	19.0
6 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
7 3 HG	19	.030	12.18	36	12.231	20912	39	101	20	.113	3.9	11	2.3	74	3.0
8 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
9 C.T.	19	.010	6.70	36	6.729	3538	8	11	6	.193	1.1	2	.9	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.7	2	.9		
1 IDLE	19	.020	12.95	29	12.991	3175	5	10	2	.232	1.2	2	.5	0	11.5
2 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
3 10 HG	19	.030	13.58	30	13.631	19062	21	63	10	.197	3.1	9	1.5	95	10.0
4 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
5 19 HG	19	.030	7.04	36	7.089	6577	19	56	11	.057	.8	3	.6	9	19.0
6 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
7 3 HG	19	.030	12.18	36	12.231	20912	39	101	20	.113	3.9	11	2.3	74	3.0
8 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
9 C.T.	19	.010	6.70	36	6.729	3538	8	11	6	.193	1.1	2	.9	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.7	2	.9		
1 IDLE	19	.020	12.95	29	12.991	3175	5	10	2	.232	1.2	2	.5	0	11.5
2 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
3 10 HG	19	.030	13.58	30	13.631	19062	21	63	10	.197	3.1	9	1.5	95	10.0
4 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
5 19 HG	19	.030	7.04	36	7.089	6577	19	56	11	.057	.8	3	.6	9	19.0
6 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
7 3 HG	19	.030	12.18	36	12.231	20912	39	101	20	.113	3.9	11	2.3	74	3.0
8 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
9 C.T.	19	.010	6.70	36	6.729	3538	8	11	6	.193	1.1	2	.9	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.7	2	.9		
1 IDLE	19	.020	12.95	29	12.991	3175	5	10	2	.232	1.2	2	.5	0	11.5
2 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
3 10 HG	19	.030	13.58	30	13.631	19062	21	63	10	.197	3.1	9	1.5	95	10.0
4 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
5 19 HG	19	.030	7.04	36	7.089	6577	19	56	11	.057	.8	3	.6	9	19.0
6 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
7 3 HG	19	.030	12.18	36	12.231	20912	39	101	20	.113	3.9	11	2.3	74	3.0
8 16 HG	19	.020	12.05	30	12.091	8981	15	30	7	.077	1.2	2	.6	18	16.0
9 C.T.	19	.010	6.70	36	6.729	3538	8	11	6	.193	1.1	2	.9	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.7	2	.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------											.7	2	.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------											.7	2	.9		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(.7) + 0.65(.7) = .721 GM/BHP HR
CO- NDIR 0.35(1.8) + 0.65(1.8) = 1.798 GM/BHP HR
NO2-NDIR 0.35(.9) + 0.65(.9) = .861 GM/BHP HR
CORRECTED NO2 = .917 GM/BHP HR
BSFC = .939 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	13	.020	12.95	2	12.971	3175	0	10	0	.232	.1	2	.0	0	11.5
2 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
3 10 HG	34	.030	13.58	6	13.613	19062	3	63	2	.197	.5	9	.3	95	10.0
4 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
5 19 HG	21	.030	7.04	23	7.072	6577	2	56	7	.057	.1	3	.4	9	19.0
6 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
7 3 HG	24	.030	12.18	18	12.212	20912	4	101	10	.113	.5	11	1.1	74	3.0
8 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
9 C.T.	12	.010	6.70	10	6.711	3538	1	11	2	.193	.1	2	.3	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.1	2	.1		
1 IDLE	13	.020	12.95	2	12.971	3175	0	10	0	.232	.1	2	.0	0	11.5
2 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
3 10 HG	34	.030	13.58	6	13.613	19062	3	63	2	.197	.5	9	.3	95	10.0
4 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
5 19 HG	21	.030	7.04	23	7.072	6577	2	56	7	.057	.1	3	.4	9	19.0
6 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
7 3 HG	24	.030	12.18	18	12.212	20912	4	101	10	.113	.5	11	1.1	74	3.0
8 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
9 C.T.	12	.010	6.70	10	6.711	3538	1	11	2	.193	.1	2	.3	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.1	2	.1		
1 IDLE	13	.020	12.95	2	12.971	3175	0	10	0	.232	.1	2	.0	0	11.5
2 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
3 10 HG	34	.030	13.58	6	13.613	19062	3	63	2	.197	.5	9	.3	95	10.0
4 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
5 19 HG	21	.030	7.04	23	7.072	6577	2	56	7	.057	.1	3	.4	9	19.0
6 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
7 3 HG	24	.030	12.18	18	12.212	20912	4	101	10	.113	.5	11	1.1	74	3.0
8 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
9 C.T.	12	.010	6.70	10	6.711	3538	1	11	2	.193	.1	2	.3	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.1	2	.1		
1 IDLE	13	.020	12.95	2	12.971	3175	0	10	0	.232	.1	2	.0	0	11.5
2 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
3 10 HG	34	.030	13.58	6	13.613	19062	3	63	2	.197	.5	9	.3	95	10.0
4 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
5 19 HG	21	.030	7.04	23	7.072	6577	2	56	7	.057	.1	3	.4	9	19.0
6 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
7 3 HG	24	.030	12.18	18	12.212	20912	4	101	10	.113	.5	11	1.1	74	3.0
8 16 HG	30	.020	12.05	10	12.073	8981	2	30	2	.077	.2	2	.2	18	16.0
9 C.T.	12	.010	6.70	10	6.711	3538	1	11	2	.193	.1	2	.3	0	22.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------											.1	2	.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------											.1	2	.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------											.1	2	.1		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(.1) + 0.65(.1) = .099 GM/BHP HR
CO- NDIR 0.35(1.8) + 0.65(1.8) = 1.800 GM/BHP HR
NO2-CL 0.35(.1) + 0.65(.1) = .140 GM/BHP HR
CORRECTED NO2 = .150 GM/BHP HR
BSFC = .939 LB/BHP HR

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                      TABLE C-30. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-40  TEST-14  RUN-1   1972 STANDARD ENGINE  05-04-73      K = .889     HUM = 46.2  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE            HC      CO     CO2      NO   CARBON    CONS.       HC      CO     NO2    FACT.    HC          CO    NO2    HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE          110   1.190   10.71     93   12.019    1724        17     345      4    .232     4.0         80    1.0    0     18.9
2 30 PCT T       70    .190   12.72   1509   12.986    8437        44     249    326    .077     3.8         19   25.1   29     15.5
3 60 PCT T       56    .180   13.88   2322   14.120   14334        61     364    783    .147     9.0         54  115.0   59      8.2
4 30 PCT T       49    .160   12.59   1443   12.802    8437        34     213    327    .077     2.6         16   25.2   29     15.5
5 10 PCT T       34    .160   12.94    519   13.137    5489        15     135     72    .057      .9          8    4.1   10     20.0
6 30 PCT T       49    .180   12.71   1551   12.943    8437        34     237    336    .077     2.7         18   25.8   29     15.5
7 90 PCT T       68    .590   13.90   2719   14.563   20009       101    1637   1240    .113    11.4        185  140.1   88      2.5
8 30 PCT T       46    .180   12.86   1998   13.090    8437        32     234    428    .077     2.5         18   32.9   29     15.5
9 C.T.         2148    .390    6.68    137    9.390    1769       439     130      9    .143    62.8         19    1.2    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.5         15   13.1
1 IDLE          110   1.190   10.71     93   12.019    1724        17     345      4    .232     4.0         80    1.0    0     18.9
2 30 PCT T       65    .170   12.65   1477   12.890    8437        46     225    321    .077     3.5         17   24.7   29     15.5
3 60 PCT T       52    .160   13.91   2237   14.026   14334        57     330    759    .147     8.4         49  111.6   59      8.2
4 30 PCT T       47    .160   12.71   1584   12.921    8437        33     211    343    .077     2.6         16   26.4   29     15.5
5 10 PCT T       39    .160   13.02    555   13.222    5489        17     134     76    .057     1.0          8    4.4   10     20.0
6 30 PCT T       50    .180   12.73   1648   12.964    8437        35     237    356    .077     2.7         18   27.4   29     15.5
7 90 PCT T       70    .620   13.43   2784   14.626   20009       103    1713   1264    .113    11.7        194  142.9   88      2.5
8 30 PCT T       51    .180   13.38   2344   13.615    8437        34     225    482    .077     2.6         17   37.1   29     15.5
9 C.T.         1960    .370    7.34    168    9.827    1769       381     135     10    .143    54.5         19    1.4    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.2         15   13.3
1 IDLE          125   1.440   11.33    109   12.905    1724        18     388      5    .232     4.2         90    1.1    0     18.9
2 30 PCT T       64    .170   12.58   1492   12.829    8437        45     226    326    .077     3.5         17   25.1   29     15.5
3 60 PCT T       53    .170   13.80   2263   14.027   14334        58     351    768    .147     8.5         52  112.9   59      8.2
4 30 PCT T       48    .170   12.66   1629   12.882    8437        34     225    354    .077     2.6         17   27.3   29     15.5
5 10 PCT T       37    .160   12.95    564   13.150    5489        17     135     78    .057     1.0          8    4.5   10     20.0
6 30 PCT T       49    .180   12.71   1629   12.943    8437        34     237    353    .077     2.7         18   27.1   29     15.5
7 90 PCT T       86    .750   14.04   2758   14.883   20009       125    2036   1231    .113    14.1        230  139.1   88      2.5
8 30 PCT T       46    .170   12.75   1835   12.970    8437        32     223    396    .077     2.5         17   30.5   29     15.5
9 C.T.         2145    .350    6.80    137    9.521    1769       440     131      8    .143    63.0         19    1.2    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.6         17   13.1
1 IDLE          125   1.440   11.33    109   12.905    1724        18     388      5    .232     4.2         90    1.1    0     18.9
2 30 PCT T       64    .170   12.59   1484   12.824    8437        45     226    324    .077     3.5         17   24.9   29     15.5
3 60 PCT T       50    .160   13.77   2252   13.984   14334        55     331    766    .147     8.1         49  112.7   59      8.2
4 30 PCT T       45    .170   12.66   1604   12.879    8437        32     225    349    .077     2.5         17   26.9   29     15.5
5 10 PCT T       34    .160   12.99    529   13.187    5489        15     135     73    .057      .9          8    4.2   10     20.0
6 30 PCT T       48    .180   12.59   1575   12.822    8437        34     239    344    .077     2.6         18   26.5   29     15.5
7 90 PCT T       83    .720   14.03   2778   14.840   20009       121    1961   1243    .113    13.7        222  140.5   88      2.5
8 30 PCT T       47    .170   12.76   1853   12.981    8437        33     223    400    .077     2.5         17   30.8   29     15.5
9 C.T.         2290    .390    6.62    146    9.422    1769       462     129      9    .143    66.1         18    1.3    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.7         16   13.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.4         15   13.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     3.7         16   13.1
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(    3.4) + 0.65(    3.7) =    3.594    GM/BHP HR
                                         CO- NDIR 0.35(   14.8) + 0.65(   16.4) =   15.827    GM/BHP HR
                                         NO2-NDIR 0.35(   13.2) + 0.65(   13.1) =   13.120    GM/BHP HR
                                                             CORRECTED NO2 =   11.661    GM/BHP HR
                                                                      BSFC =     .619    LB/BHP HR
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               CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.       HC      CO     NO2    FACT.  HC-FID        CO  NO2-CL   HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         1939   1.190   10.71     38   12.094    1724        28     343      2    .232     6.4         79     .4    0     18.9
2 30 PCT T     1114    .190   12.72   1425   13.022    8437        73     249    307    .077     5.6         19   23.6   29     15.5
3 60 PCT T      904    .180   13.88   2237   14.150   14334        92     368    752    .147    13.5         54  110.6   59      8.2
4 30 PCT T      715    .160   12.59   1425   12.822    8437        47     213    311    .077     3.6         16   24.0   29     15.5
5 10 PCT T      448    .160   12.94    475   13.155    5489        19     135     66    .057     1.1          8    3.8   10     20.0
6 30 PCT T      761    .180   12.71   1487   12.966    8437        50     237    321    .077     3.9         18   24.7   29     15.5
7 90 PCT T     1084    .890   13.90   2650   14.890   20009       149    1633   1206    .113    16.9        185  136.2   88      2.5
8 30 PCT T      717    .180   12.86   2350   13.112    8437        46     234    502    .077     3.6         18   38.7   29     15.5
9 C.T.        20873    .390    6.68     50    9.107    1769       405     133      3    .143    58.0         19     .5    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.0         15   12.8
1 IDLE         1939   1.190   10.71     38   12.094    1724        28     343      2    .232     6.4         79     .4    0     18.9
2 30 PCT T      716    .170   12.65   1392   12.892    8437        47     225    302    .077     3.6         17   23.3   29     15.5
3 60 PCT T      678    .160   13.81   2187   14.038   14334        69     330    741    .147    10.2         49  109.0   59      8.2
4 30 PCT T      627    .160   12.71   1525   12.933    8437        41     211    330    .077     3.1         16   25.4   29     15.5
5 10 PCT T      404    .160   13.02    512   13.220    5489        17     134     71    .057     1.0          8    4.0   10     20.0
6 30 PCT T      672    .180   12.73   1583   12.977    8437        44     236    342    .077     3.4         18   26.3   29     15.5
7 90 PCT T      545    .620   13.93   2700   14.604   20009        75    1715   1228    .113     8.4        194  138.7   88      2.5
8 30 PCT T      810    .180   13.38   2493   13.691    8437        50     225    500    .077     3.9         17   38.5   29     15.5
9 C.T.        19284    .370    7.34     37    9.638    1769       354     137      2    .143    50.6         20     .3    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.2         15   13.0
1 IDLE         2544   1.440   11.33     50   13.025    1724        34     385      2    .232     7.8         89     .5    0     18.9
2 30 PCT T     1024    .170   12.59   1420   12.963    8437        67     225    309    .077     5.2         17   23.8   29     15.5
3 60 PCT T      903    .170   13.80   2212   14.060   14334        92     350    749    .147    13.5         51  110.1   59      8.2
4 30 PCT T      761    .170   12.66   1575   12.906    8437        50     224    342    .077     3.9         17   26.3   29     15.5
5 10 PCT T      561    .160   12.95    512   13.166    5489        23     135     71    .057     1.3          8    4.0   10     20.0
6 30 PCT T      806    .180   12.71   1587   12.971    8437        52     237    343    .077     4.0         18   26.4   29     15.5
7 90 PCT T      500    .750   14.04   2750   14.840   20009        67    2042   1231    .113     7.6        231  139.1   88      2.5
8 30 PCT T      806    .170   12.75   1767   13.001    8437        52     223    385    .077     4.0         17   29.6   29     15.5
9 C.T.        27720    .350    6.80     18    9.922    1769       494     126      2    .143    70.7         18     .3    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.2         17   12.8
1 IDLE         2544   1.440   11.33     50   13.025    1724        34     385      2    .232     7.8         89     .5    0     18.9
2 30 PCT T      939    .170   12.59   1425   12.854    8437        62     225    311    .077     4.7         17   23.9   29     15.5
3 60 PCT T      768    .160   13.77   2112   14.007   14334        79     331    718    .147    11.5         49  105.5   59      8.2
4 30 PCT T      761    .170   12.66   1879   12.906    8437        50     224    408    .077     3.8         17   31.4   29     15.5
5 10 PCT T      449    .160   12.99    487   13.195    5489        19     134     67    .057     1.1          8    3.8   10     20.0
6 30 PCT T      805    .180   12.59   1512   12.851    8437        53     239    330    .077     4.1         18   25.4   29     15.5
7 90 PCT T      727    .720   14.03   2750   14.823   20009        98    1969   1232    .113    11.1        222  139.2   88      2.5
8 30 PCT T      806    .170   12.76   1583   13.011    8437        52     223    341    .077     4.0         17   26.2   29     15.5
9 C.T.        27674    .390    6.62     50    9.727    1769       503     125      3    .143    72.0         18     .4    0     25.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.3         16   12.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.6         15   12.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.2         16   12.7
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(    3.6) + 0.65(    4.2) =    3.999    GM/BHP HR
                                         CO- NDIR 0.35(   14.8) + 0.65(   16.3) =   15.793    GM/BHP HR
                                         NO2-CL   0.35(   12.9) + 0.65(   12.7) =   12.761    GM/BHP HR
                                                             CORRECTED NO2 =   11.342    GM/BHP HR
                                                                      BSFC =     .619    LB/BHP HR
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                TABLE C-31. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-00  TEST-19  RUN=2   1972 STANDARD ENGINE  05-04-73      F = .084      HUM = 45.1  GR/LB
------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE           HC      CO     CO2     NO    CARBON    CONS.      HC      CO     NO2    FACT.    HC      CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        115   1.040  10.87      67   12.034     1724      18     301       3   .232     4.1     70     .7     0   18.9
2 30 PCT T     67    .170  12.50    1224   12.742     8437      48     227     269   .077     3.7     18   20.7    29   15.5
3 60 PCT T     54    .194  13.77    2143   14.018    14339      60     392     727   .147     8.8     58  106.9    59    8.2
4 30 PCT T     51    .170  12.67    1528   12.895     8437      36     225     332   .077     2.8     17   25.6    29   15.5
5 10 PCT T     39    .150  12.82     468   13.012     5489      18     128      66   .057     1.0      7    3.7    10   20.0
6 30 PCT T     53    .170  12.61    1448   12.837     8437      38     226     316   .077     2.9     17   24.3    29   15.5
7 90 PCT T     82    .690  13.92    2666   14.699    20004     121    1897    1205   .113    13.6    214  136.1    88    2.5
8 30 PCT T     48    .170  12.73    1716   12.952     8437      34     224     371   .077     2.6     17   28.6    29   15.5
9 C.T.       2893    .380   6.55      94    9.406     1769     466     144       6   .143    66.6     21     .8     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.8     16   12.3
1 IDLE        115   1.040  10.87      67   12.034     1724      18     301       3   .232     4.1     70     .7     0   18.9
2 30 PCT T     45    .170  12.64    1374   12.880     8437      46     225     300   .077     3.5     17   23.1    29   15.5
3 60 PCT T     56    .200  13.95    2143   14.210    14339      61     408     734   .147     9.0     60  108.0    59    8.2
4 30 PCT T     44    .180  12.80    1471   13.033     8437      34     235     316   .077     2.6     18   24.3    29   15.5
5 10 PCT T     37    .170  12.95     662   13.160     5489      17     143      92   .057     1.0      8    5.2    10   20.0
6 30 PCT T     48    .180  12.74    1527   13.022     8437      34     236     328   .077     2.6     18   25.3    29   15.5
7 90 PCT T     84    .870  14.04    2461   15.006    20004     128    2343    1089   .113    14.5    265  123.1    88    2.5
8 30 PCT T     47    .180  12.81    1656   13.091     8437      33     235     356   .077     2.5     18   27.4    29   15.5
9 C.T.       1817    .350   7.78      97   10.092     1769     344     124       6   .143    49.2     18     .8     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.2     17   12.0
1 IDLE        118   1.330  11.33      81   12.787     1724      17     362       4   .232     4.0     84     .8     0   18.9
2 30 PCT T     63    .170  12.66    1445   12.898     8437      45     225     314   .077     3.4     17   24.2    29   15.5
3 60 PCT T     53    .160  13.79    2210   14.007    14339      59     331     751   .147     8.6     49  110.4    59    8.2
4 30 PCT T     48    .170  12.68    1596   12.902     8437      34     225     347   .077     2.6     17   26.7    29   15.5
5 10 PCT T     36    .160  12.84     524   13.089     5489      16     136      73   .057      .9      8    4.2    10   20.0
6 30 PCT T     50    .200  12.68    1647   12.934     8437      35     264     357   .077     2.7     20   27.5    29   15.5
7 90 PCT T     82    .760  13.97    2714   14.819    20004     120    2072    1216   .113    13.5    234  137.4    88    2.5
8 30 PCT T     45    .170  12.64    1787   12.859     8437      32     225     383   .077     2.5     17   29.5    29   15.5
9 C.T.       2186    .330   6.66      99    9.351     1769     447     126       6   .143    63.9     18     .9     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.6     16   12.8
1 IDLE        118   1.330  11.33      81   12.787     1724      17     362       4   .232     4.0     84     .8     0   18.9
2 30 PCT T     67    .170  12.60    1445   12.822     8437      48     226     316   .077     3.7     17   24.3    29   15.5
3 60 PCT T     56    .170  13.78    2218   14.010    14339      62     351     753   .147     9.1     52  110.7    59    8.2
4 30 PCT T     60    .170  12.65    1563   12.874     8437      35     225     340   .077     2.7     17   26.2    29   15.5
5 10 PCT T     34    .150  12.91     447   13.102     5489      18     127      69   .057     1.0      7    3.9    10   20.0
6 30 PCT T     51    .170  12.62    1548   12.845     8437      36     226     338   .077     2.8     17   26.0    29   15.5
7 90 PCT T     82    .890  14.00    2653   14.929    20004     119    2274    1180   .113    13.4    257  133.4    88    2.5
8 30 PCT T     46    .180  12.63    1846   12.860     8437      33     239     402   .077     2.5     18   31.0    29   15.5
9 C.T.       2209    .360   6.80     103    9.596     1769     442     135       6   .143    63.2     19     .9     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     3.6     17   12.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     3.5     16   12.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     3.6     17   12.7
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(     3.5) + 0.65(     3.6) =    3.563   GM/BHP HR
                                        CO- NDIR 0.35(    16.5) + 0.65(    16.9) =   16.755   GM/BHP HR
                                        NO2-NDIR 0.35(    12.1) + 0.65(    12.7) =   12.520   GM/BHP HR
                                                              CORRECTED NO2 =   11.067   GM/BHP HR
                                                                       BSFC =     .619   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE          HC-FID    CO     CO2   NO-CL  CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       2404   1.040  10.87      50   12.150     1724      34     298       2   .232     7.9     69     .5     0   18.9
2 30 PCT T   1385    .170  12.50    1200   12.809     8437      91     226     262   .077     7.0     17   20.2    29   15.5
3 60 PCT T   1011    .194  13.77    2190   14.061    14339     103     391     741   .147    15.1     58  109.0    59    8.2
4 30 PCT T    990    .170  12.67    1518   12.939     8437      65     224     329   .077     5.0     17   25.3    29   15.5
5 10 PCT T    538    .150  12.82     450   13.024     5489      23     128      63   .057     1.3      7    3.6    10   20.0
6 30 PCT T    984    .170  12.61    1450   12.878     8437      64     225     315   .077     5.0     17   24.3    29   15.5
7 90 PCT T   1816    .690  13.92    2700   14.792    20004     246    1885    1212   .113    27.9    213  137.0    88    2.5
8 30 PCT T    990    .170  12.73    2200   12.994     8437      61     223     474   .077     4.7     17   36.5    29   15.5
9 C.T.      31997    .380   6.55      80   10.080     1769     553     135       5   .143    79.0     19     .7     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     5.4     15   12.6
1 IDLE       2404   1.040  10.87      50   12.150     1724      34     298       2   .232     7.9     69     .5     0   18.9
2 30 PCT T   1191    .170  12.64    1350   12.924     8437      74     224     293   .077     5.7     17   22.5    29   15.5
3 60 PCT T   1040    .200  13.95    2168   14.254    14339     105     406     724   .147    15.4     60  106.4    59    8.2
4 30 PCT T    672    .180  12.80    1475   13.047     8437      43     235     317   .077     3.3     18   24.4    29   15.5
5 10 PCT T    785    .170  12.95     650   13.198     5489      33     143      90   .057     1.9      8    5.1    10   20.0
6 30 PCT T    918    .180  12.74    1512   13.062     8437      59     235     324   .077     4.6     18   25.0    29   15.5
7 90 PCT T   2007    .870  14.04    2450   15.110    20004     265    2327    1077   .113    30.0    263  121.7    88    2.5
8 30 PCT T    863    .180  12.81    1533   13.076     8437      56     235     328   .077     4.3     18   25.3    29   15.5
9 C.T.      25805    .350   7.78     104   10.710     1769     426     117       6   .143    60.9     17     .9     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     4.7     17   11.7
1 IDLE       2969   1.330  11.33      50   12.907     1724      33     359       2   .232     7.7     83     .5     0   18.9
2 30 PCT T   1493    .170  12.66    1458   12.974     8437      94     223     315   .077     7.2     17   24.2    29   15.5
3 60 PCT T    994    .160  13.79    2187   14.049    14339     101     330     741   .147    14.9     48  108.9    59    8.2
4 30 PCT T    895    .170  12.68    1575   12.940     8437      58     224     341   .077     4.5     17   26.3    29   15.5
5 10 PCT T    538    .160  12.84     506   13.104     5489      23     135      70   .057     1.3      8    4.0    10   20.0
6 30 PCT T   1477    .200  12.68    1642   13.028     8437      96     262     353   .077     7.4     20   27.2    29   15.5
7 90 PCT T   1909    .760  13.97    2700   14.921    20004     256    2058    1202   .113    28.9    233  135.8    88    2.5
8 30 PCT T    884    .170  12.64    1758   12.890     8437      58     225     382   .077     4.5     17   29.4    29   15.5
9 C.T.      27681    .330   6.66     111    9.758     1769     502     121       7   .143    71.8     17    1.0     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     5.2     16   12.7
1 IDLE       2969   1.330  11.33      50   12.907     1724      33     359       2   .232     7.7     83     .5     0   18.9
2 30 PCT T   1252    .170  12.58    1431   12.875     8437      82     225     311   .077     6.3     17   24.0    29   15.5
3 60 PCT T    903    .170  13.78    2281   14.090    14339      92     351     773   .147    13.6     52  113.7    59    8.2
4 30 PCT T    895    .170  12.65    1543   12.909     8437      58     224     335   .077     4.5     17   25.8    29   15.5
5 10 PCT T    538    .150  12.91     481   13.114     5489      23     127      67   .057     1.3      7    3.8    10   20.0
6 30 PCT T    898    .170  12.62    1575   12.874     8437      59     225     343   .077     4.5     17   26.4    29   15.5
7 90 PCT T   1911    .890  14.00    2675   15.031    20004     254    2258    1182   .113    28.7    255  133.6    88    2.5
8 30 PCT T    917    .180  12.63    1850   12.902     8437      60     238     402   .077     4.6     18   30.9    29   15.5
9 C.T.      26869    .360   6.80     114    9.847     1769     483     131       7   .143    69.0     19    1.0     0   25.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     5.0     17   12.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     5.1     16   12.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     5.1     17   12.7
FOUR CYCLE COMPOSITE =                  HC- FID  0.35(     5.1) + 0.65(     5.1) =    5.095   GM/BHP HR
                                        CO- NDIR 0.35(    16.4) + 0.65(    16.8) =   16.625   GM/BHP HR
                                        NO2-CL   0.35(    12.2) + 0.65(    12.7) =   12.518   GM/BHP HR
                                                              CORRECTED NO2 =   11.062   GM/BHP HR
                                                                       BSFC =     .619   LB/BHP HR
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                         TABLE C-32. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-00  TEST-14  RUN-3   1972 STANDARD ENGINE  05-04-73      K = .908      HUM = 50.7  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR           MAN.
MODE           HC       CO     CO2     NO   CARBON    CONS.     HC      CO     NO2   FACT.   HC      CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        180    1.070   10.64     83   11.904    1724      28     313       4   .232    6.5     73      .9     0    18.9
2 30 PCT T     71     .160   12.38   1058   12.617    8437      51     216     235   .077    3.9     17    18.1    29    15.5
3 60 PCT T     56     .190   13.61   1876   13.860   19334      63     397     644   .147    9.2     58    94.7    59     8.2
4 30 PCT T     50     .160   12.49   1328   12.704    8437      36     215     293   .077    2.8     17    22.5    29    15.5
5 10 PCT T     35     .150   12.57    364   12.758    5489      16     130      52   .057     .9      7     3.0    10    20.0
6 30 PCT T     47     .170   12.43   1219   12.651    8437      34     229     270   .077    2.6     18    20.8    29    15.5
7 90 PCT T     70     .630   13.76   2507   14.466   20009     105    1760    1151   .113   11.8    199   130.1    88     2.5
8 30 PCT T     46     .160   12.76   1729   12.970    8437      32     210     373   .077    2.5     16    28.8    29    15.5
9 C.T.       1945     .330    7.25    128    9.681    1769     384     122       8   .143   54.9     17     1.1     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      3.4     15    11.3
1 IDLE        180    1.070   10.64     83   11.904    1724      28     313       4   .232    6.5     73      .9     0    18.9
2 30 PCT T     59     .160   12.53   1328   12.754    8437      42     214     292   .077    3.2     16    22.5    29    15.5
3 60 PCT T     47     .160   13.58   1973   13.791   19334      53     336     681   .147    7.8     49   100.1    59     8.2
4 30 PCT T     44     .170   12.60   1395   12.818    8437      31     226     313   .077    2.4     17    24.1    29    15.5
5 10 PCT T     34     .160   12.81    466   13.007    5489      15     136      65   .057     .9      8     3.7    10    20.0
6 30 PCT T     45     .170   12.56   1466   12.779    8437      32     227     321   .077    2.5     17    24.7    29    15.5
7 90 PCT T     77     .770   13.92   2708   14.773   20009     113    2106    1217   .113   12.7    238   137.6    88     2.5
8 30 PCT T     41     .170   12.65   1713   12.864    8437      29     225     373   .077    2.2     17    28.7    29    15.5
9 C.T.       2096     .340    6.89    153    9.494    1769     424     129      10   .143   60.6     18     1.4     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      3.5     16    12.2
1 IDLE        119    1.630   11.20    122   12.959    1724      17     438       5   .232    4.0    102     1.3     0    18.9
2 30 PCT T     64     .170   12.50   1399   12.739    8437      46     227     308   .077    3.5     18    23.7    29    15.5
3 60 PCT T     50     .160   13.62   2096   13.834   19334      56     335     721   .147    8.2     49   106.0    59     8.2
4 30 PCT T     45     .160   12.59   1419   12.799    8437      32     214     318   .077    2.5     16    24.5    29    15.5
5 10 PCT T     36     .160   12.93    516   13.129    5489      16     135      72   .057     .9      8     4.1    10    20.0
6 30 PCT T     47     .180   12.62   1564   12.851    8437      33     239     341   .077    2.6     18    26.2    29    15.5
7 90 PCT T     84     .780   13.98   2659   14.851   20009     122    2122    1189   .113   13.8    240   134.4    88     2.5
8 30 PCT T     44     .170   12.56   1663   12.778    8437      31     227     365   .077    2.4     17    28.1    29    15.5
9 C.T.       2081     .360    7.02    132    9.627    1769     413     134       8   .143   59.1     19     1.2     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      3.4     17    12.4
1 IDLE        119    1.630   11.20    122   12.959    1724      17     438       5   .232    4.0    102     1.3     0    18.9
2 30 PCT T     58     .180   12.49   1315   12.733    8437      42     241     289   .077    3.2     19    22.3    29    15.5
3 60 PCT T     48     .170   13.75   2198   13.972   19334      53     352     749   .147    7.8     52   110.1    59     8.2
4 30 PCT T     42     .170   12.71   1610   12.925    8437      30     224     344   .077    2.3     17    26.4    29    15.5
5 10 PCT T     34     .160   12.93    523   13.127    5489      15     135      73   .057     .9      8     4.1    10    20.0
6 30 PCT T     43     .170   12.56   1525   12.776    8437      31     227     334   .077    2.4     17    25.7    29    15.5
7 90 PCT T     82     .760   13.93   2730   14.779   20009     120    2078    1227   .113   13.5    235   138.6    88     2.5
8 30 PCT T     42     .160   12.61   1745   12.815    8437      30     213     381   .077    2.3     16    29.4    29    15.5
9 C.T.       2110     .340    6.89    134    9.509    1769     424     128       8   .143   60.6     18     1.2     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      3.4     17    12.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------      3.4     16    11.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------      3.4     17    12.6
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.4) + 0.65(     3.4) =    3.434   GM/BHP HR
                                        CO- NDIR 0.35(    15.5) + 0.65(    17.2) =   16.609   GM/BHP HR
                                        NO2-NDIR 0.35(    11.8) + 0.65(    12.6) =   12.271   GM/BHP HR
                                                              CORRECTED NO2 =   11.148   GM/BHP HR
                                                                       BSFC =     .619   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR             MAN.
MODE          HC-FID     CO     CO2  NO-CL  CARBON    CONS.     HC      CO     NO2   FACT.  HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        2571   1.070   10.64     25   11.967    1724      37     311       1   .232    8.6     72      .3     0    18.9
2 30 PCT T    1027    .160   12.38   1013   12.643    8437      69     216     224   .077    5.3     17    17.3    29    15.5
3 60 PCT T     677    .190   13.61   1885   13.868   19334      70     397     626   .147   10.3     58    92.1    59     8.2
4 30 PCT T     715    .160   12.49   1287   12.721    8437      47     214     283   .077    3.7     17    21.8    29    15.5
5 10 PCT T     313    .150   12.57    325   12.751    5489      13     130      46   .057     .8      7     2.6    10    20.0
6 30 PCT T     670    .170   12.43   1125   12.667    8437      45     229     249   .077    3.4     18    19.2    29    15.5
7 90 PCT T    1133    .630   13.76   2500   14.503   20009     156    1755    1145   .113   17.7    198   129.4    88     2.5
8 30 PCT T     593    .160   12.76   1887   12.979    8437      39     210     407   .077    3.0     16    31.4    29    15.5
9 C.T.       20188    .330    7.25     86    9.599    1769     372     123       5   .143   53.2     18      .8     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      3.7     15    11.1
1 IDLE        2571   1.070   10.64     25   11.967    1724      37     311       1   .232    8.6     72      .3     0    18.9
2 30 PCT T    1028    .160   12.53   1312   12.793    8437      68     213     287   .077    5.2     16    22.1    29    15.5
3 60 PCT T     721    .160   13.58   1937   13.812   19334      75     335     667   .147   11.0     49    98.1    59     8.2
4 30 PCT T     716    .170   12.60   1395   12.842    8437      47     226     304   .077    3.6     17    23.4    29    15.5
5 10 PCT T     358    .160   12.81    425   13.006    5489      15     136      60   .057     .9      8     3.4    10    20.0
6 30 PCT T     760    .170   12.56   1437   12.806    8437      50     226     314   .077    3.9     17    24.2    29    15.5
7 90 PCT T    1545    .770   13.92   2675   14.844   20009     208    2096    1197   .113   23.5    237   135.2    88     2.5
8 30 PCT T     716    .170   12.65   1825   12.892    8437      47     225     397   .077    3.6     17    30.5    29    15.5
9 C.T.       25673    .340    6.89     95    9.797    1769     466     125       6   .143   66.6     18      .8     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      4.5     16    12.0
1 IDLE        2461   1.630   11.20     50   13.076    1724      32     434       2   .232    7.5    101      .5     0    18.9
2 30 PCT T    1073    .170   12.50   1370   12.777    8437      71     227     300   .077    5.5     17    23.1    29    15.5
3 60 PCT T     722    .160   13.62   2081   13.852   19334      75     334     715   .147   11.0     49   105.1    59     8.2
4 30 PCT T     715    .160   12.59   1382   12.822    8437      47     214     304   .077    3.6     16    23.4    29    15.5
5 10 PCT T     381    .160   12.93    487   13.128    5489      16     135      68   .057     .9      8     3.9    10    20.0
6 30 PCT T     805    .180   12.62   1506   12.881    8437      53     239     328   .077    4.1     18    25.2    29    15.5
7 90 PCT T    1682    .780   13.98   2675   14.928   20009     225    2111    1190   .113   25.5    239   134.5    88     2.5
8 30 PCT T     715    .170   12.56   1862   12.802    8437      47     226     407   .077    3.6     17    31.4    29    15.5
9 C.T.       25121    .360    7.02     99    9.892    1769     449     130       6   .143   64.2     19      .8     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      4.5     17    12.3
1 IDLE        2461   1.630   11.20     50   13.076    1724      32     434       2   .232    7.5    101      .5     0    18.9
2 30 PCT T    1028    .180   12.49   1270   12.773    8437      68     240     279   .077    5.2     18    21.5    29    15.5
3 60 PCT T     813    .170   13.75   2155   14.001   19334      83     352     733   .147   12.2     52   107.7    59     8.2
4 30 PCT T     761    .170   12.71   1480   12.956    8437      50     224     320   .077    3.8     17    24.6    29    15.5
5 10 PCT T     404    .160   12.93    475   13.130    5489      17     135      66   .057    1.0      8     3.8    10    20.0
6 30 PCT T     805    .170   12.56   1537   12.810    8437      53     226     336   .077    4.1     17    25.9    29    15.5
7 90 PCT T    1636    .760   13.93   2750   14.854   20009     220    2068    1230   .113   24.9    234   139.4    88     2.5
8 30 PCT T     716    .160   12.61   1875   12.842    8437      47     212     409   .077    3.6     16    31.5    29    15.5
9 C.T.       25658    .340    6.89    105    9.796    1769     463     124       6   .143   66.3     18      .9     0    25.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------      4.6     17    12.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------      4.1     15    11.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------      4.5     17    12.4
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.1) + 0.65(     4.5) =    4.372   GM/BHP HR
                                        CO- NDIR 0.35(    15.5) + 0.65(    17.1) =   16.522   GM/BHP HR
                                        NO2-CL   0.35(    11.6) + 0.65(    12.4) =   12.138   GM/BHP HR
                                                              CORRECTED NO2 =   11.027   GM/BHP HR
                                                                       BSFC =     .619   LB/BHP HR
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                   TABLE C-33. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-0   TEST 71  RUN-1   1973 STANDARD ENGINE  08-16-73      K = .903      HUM = 49.3  GR/LB
------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR            MAN.
MODE          HC      CO     CO2      NO    CARBON   CONS.      HC      CO     NO2     FACT.    HC        CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         117    .460   10.68     85   11.266    2087      23     172       5     .232     5.4       40     1.2      0    16.6
2 30 PCT T      57    .210   13.73    578   14.002    8573      38     260     117     .077     2.9       20     9.0     27    14.8
3 60 PCT T      67    .580   14.49   1222   15.142   13744      66    1063     368     .147     9.7      156    54.1     55     8.9
4 30 PCT T      41    .170   13.73    672   13.944    8573      27     211     137     .077     2.1       16    10.6     27    14.8
5 10 PCT T      35    .140   13.88    283   14.058    6033      16     121      40     .057      .9        7     2.3      9    18.6
6 30 PCT T      26    .170   13.73    623   13.928    8573      17     211     127     .077     1.3       16     9.8     27    14.8
7 90 PCT T      94   2.430   13.73   1043   16.262   19233     120    5806     410     .113    13.6      656    46.3     81     3.0
8 30 PCT T      34    .160   13.88    658   14.077    8573      22     197     133     .077     1.7       15    10.2     27    14.8
9 C.T.        1602    .600    8.42     95   10.750    2268     365     256       7     .143    52.2       37     1.0      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.4       37     5.5
1 IDLE         117    .460   10.68     85   11.266    2087      23     172       5     .232     5.4       40     1.2      0    16.6
2 30 PCT T      64    .180   13.73    651   13.979    8573      42     223     133     .077     3.3       17    10.2     27    14.8
3 60 PCT T      77    .600   14.49   1309   15.173   13744      75    1098     392     .147    11.1      161    57.6     55     8.9
4 30 PCT T      49    .170   13.88    752   14.103    8573      32     209     152     .077     2.5       16    11.7     27    14.8
5 10 PCT T      44    .130   14.03    383   14.208    6033      20     112      54     .057     1.2        6     3.1      9    18.6
6 30 PCT T      40    .170   13.73    765   13.943    8573      27     211     156     .077     2.0       16    12.0     27    14.8
7 90 PCT T      95   2.510   13.58   1091   16.194   19233     122    6022     430     .113    13.8      681    48.6     81     3.0
8 30 PCT T      36    .170   13.58    761   13.784    8573      24     214     157     .077     1.9       16    12.1     27    14.8
9 C.T.        1563    .590    8.62    154   10.898    2268     351     248      11     .143    50.2       35     1.6      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.5       38     6.0
1 IDLE         111    .820   11.53    268   12.470    2087      20     277      15     .232     4.7       64     3.5      0    16.6
2 30 PCT T      53    .200   13.73    742   13.987    8573      35     248     151     .077     2.7       19    11.6     27    14.8
3 60 PCT T      76    .560   14.33   1299   14.972   13744      75    1038     394     .147    11.1      153    58.0     55     8.9
4 30 PCT T      41    .170   13.88    821   14.094    8573      27     209     166     .077     2.1       16    12.8     27    14.8
5 10 PCT T      36    .130   14.03    431   14.199    6033      17     112      61     .057      .9        6     3.5      9    18.6
6 30 PCT T      38    .160   13.88    843   14.078    8573      23     197     170     .077     1.8       15    13.1     27    14.8
7 90 PCT T      88   2.440   13.58   1168   16.115   19233     113    5882     463     .113    12.8      665    52.3     81     3.0
8 30 PCT T      34    .160   13.88    835   14.077    8573      22     197     169     .077     1.7       15    13.0     27    14.8
9 C.T.        1562    .610    8.62    228   10.917    2268     350     256      16     .143    50.1       37     2.2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.4       38     6.5
1 IDLE         111    .820   11.53    268   12.470    2087      20     277      15     .232     4.7       64     3.5      0    16.6
2 30 PCT T      53    .200   13.73    825   13.987    8573      35     248     168     .077     2.7       19    12.9     27    14.8
3 60 PCT T      60    .660   14.33   1370   15.055   13744      59    1217     415     .147     8.7      179    61.0     55     8.9
4 30 PCT T      33    .160   13.88    863   14.076    8573      22     197     178     .077     1.7       15    13.7     27    14.8
5 10 PCT T      33    .140   14.03    466   14.206    6033      15     120      66     .057      .9        7     3.7      9    18.6
6 30 PCT T      37    .170   13.88    866   14.090    8573      24     209     175     .077     1.9       16    13.5     27    14.8
7 90 PCT T      91   2.510   13.58   1178   16.188   19233     117    6024     465     .113    13.2      681    52.5     81     3.0
8 30 PCT T      43    .170   14.03    903   14.246    8573      28     207     180     .077     2.2       16    13.9     27    14.8
9 C.T.        1344    .590    8.82    326   10.867    2268     304     249      23     .143    43.5       36     3.2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.0       39     6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------      3.5       37     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------      3.2       39     6.6
FOUR CYCLE COMPOSITE -                         HC- NDIR 0.35(     3.5) + 0.65(     3.2) =    3.290   GM/BHP HR
                                               CO- NDIR 0.35(    37.3) + 0.65(    38.7) =   38.206   GM/BHP HR
                                               NO2-NDIR 0.35(     5.8) + 0.65(     6.6) =    6.346   GM/BHP HR
                                                                     CORRECTED NO2 =    5.728   GM/BHP HR
                                                                              BSFC =     .673   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR            MAN.
MODE          HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2     FACT.  HC-FID      CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        1792    .460   10.68     42   11.319    2087      33     171       3     .232     7.7       40      .6      0    16.6
2 30 PCT T     790    .210   13.73    575   14.019    8573      48     259     117     .077     3.7       20     9.0     27    14.8
3 60 PCT T    1396    .580   14.49   1213   15.210   13744     126    1059     364     .147    18.5      156    53.5     55     8.9
4 30 PCT T     465    .170   13.73    670   13.946    8573      29     211     137     .077     2.2       16    10.5     27    14.8
5 10 PCT T     226    .140   13.88    255   14.043    6033      10     121      36     .057      .6        7     2.1      9    18.6
6 30 PCT T     409    .170   13.73    610   13.941    8573      25     211     125     .077     1.9       16     9.6     27    14.8
7 90 PCT T    2313   2.430   13.73   1013   16.391   19233     271    5760     395     .113    30.7      651    44.6     81     3.0
8 30 PCT T     332    .160   13.88    650   14.073    8573      20     197     131     .077     1.6       15    10.1     27    14.8
9 C.T.       20369    .600    8.42     20   11.057    2268     418     249       1     .143    59.7       36      .2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      4.8       37     5.4
1 IDLE        1792    .460   10.68     42   11.319    2087      33     171       3     .232     7.7       40      .6      0    16.6
2 30 PCT T     635    .180   13.73    585   13.974    8573      39     223     119     .077     3.0       17     9.2     27    14.8
3 60 PCT T    1361    .600   14.49   1250   15.226   13744     123    1094     375     .147    18.1      161    55.1     55     8.9
4 30 PCT T     398    .170   13.88    650   14.090    8573      24     209     131     .077     1.9       16    10.1     27    14.8
5 10 PCT T     205    .130   14.03    270   14.180    6033       9     112      38     .057      .5        6     2.2      9    18.6
6 30 PCT T     388    .170   13.73    690   13.939    8573      24     211     141     .077     1.8       16    10.8     27    14.8
7 90 PCT T    2298   2.510   13.58   1013   16.320   19233     271    5975     396     .113    30.6      675    44.8     81     3.0
8 30 PCT T     310    .170   13.58    680   13.781    8573      19     214     140     .077     1.5       16    10.8     27    14.8
9 C.T.       20836    .590    8.62     20   11.294    2268     418     239       1     .143    59.8       34      .2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      4.8       38     5.5
1 IDLE        1978    .820   11.53     60   12.548    2087      33     275       3     .232     7.6       64      .8      0    16.6
2 30 PCT T     677    .200   13.73    600   13.998    8573      41     247     122     .077     3.2       19     9.4     27    14.8
3 60 PCT T    1777    .560   14.33   1175   15.068   13744     162    1032     356     .147    23.8      152    52.3     55     8.9
4 30 PCT T     398    .170   13.88    680   14.090    8573      24     209     137     .077     1.9       16    10.6     27    14.8
5 10 PCT T     198    .130   14.03    255   14.180    6033       8     112      36     .057      .5        6     2.1      9    18.6
6 30 PCT T     382    .160   13.88    680   14.078    8573      23     197     137     .077     1.8       15    10.6     27    14.8
7 90 PCT T    2354   2.440   13.58   1025   16.255   19233     278    5832     403     .113    31.5      659    45.5     81     3.0
8 30 PCT T     324    .160   13.88    690   14.072    8573      20     197     140     .077     1.5       15    10.7     27    14.8
9 C.T.       21273    .610    8.62     20   11.357    2268     425     246       1     .143    60.7       35      .2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      5.1       38     5.4
1 IDLE        1978    .820   11.53     60   12.548    2087      33     275       3     .232     7.6       64      .8      0    16.6
2 30 PCT T     720    .200   13.73    660   14.002    8573      44     247     134     .077     3.4       19    10.3     27    14.8
3 60 PCT T    1395    .660   14.33   1225   15.129   13744     127    1211     369     .147    18.6      178    54.3     55     8.9
4 30 PCT T     429    .160   13.88    700   14.082    8573      26     197     141     .077     2.0       15    10.9     27    14.8
5 10 PCT T     205    .140   14.03    260   14.190    6033       9     120      37     .057      .5        7     2.1      9    18.6
6 30 PCT T     398    .170   13.88    680   14.090    8573      24     209     137     .077     1.9       16    10.6     27    14.8
7 90 PCT T    2326   2.510   13.58   1000   16.323   19233     274    5974     391     .113    31.0      675    44.2     81     3.0
8 30 PCT T     353    .170   14.03    715   14.235    8573      21     207     143     .077     1.6       16    11.0     27    14.8
9 C.T.       21741    .590    8.82     20   11.584    2268     426     233       1     .143    60.9       33      .2      0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      4.9       39     5.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------      4.8       37     5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------      5.0       38     5.5
FOUR CYCLE COMPOSITE -                         HC- FID  0.35(     4.8) + 0.65(     5.0) =    4.913   GM/BHP HR
                                               CO- NDIR 0.35(    37.1) + 0.65(    38.3) =   37.891   GM/BHP HR
                                               NO2-CL   0.35(     5.4) + 0.65(     5.5) =    5.460   GM/BHP HR
                                                                     CORRECTED NO2 =    4.929   GM/BHP HR
                                                                              BSFC =     .673   LB/BHP HR
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                    TABLE C-34. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-0   TEST 71  RUN 2   1973 STANDARD ENGINE  08-16-73      K =1.054     HUM = 94.8  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE           HC      CO     CO2      NO   CARBON    CONS.      HC     CO    NO2    FACT.    HC      CO    NO2    HP   VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE        105    .500   10.48      79   11.093     2087      21    190      5    .232     4.9     44    1.1     0   16.6
2 30 PCT T     58    .160   13.29     515   13.513     8573      40    205    108    .077     3.1     16    8.3    27   14.8
3 60 PCT T     86    .640   14.34    1264   15.073    13744      85   1179    383    .147    12.5    173   56.2    55    8.9
4 30 PCT T     46    .150   13.52     637   13.720     8573      31    189    132    .077     2.4     15   10.2    27   14.8
5 10 PCT T     39    .130   13.51     231   13.682     6033      19    116     34    .057     1.1      7    1.9     9   18.6
6 30 PCT T     32    .150   13.47     611   13.655     8573      22    190    127    .077     1.7     15    9.8    27   14.8
7 90 PCT T     99   2.060   13.58    1172   15.747    19233     131   5082    475    .113    14.8    574   53.7    81    3.0
8 30 PCT T     42    .150   13.58     689   13.775     8573      28    189    142    .077     2.2     15   11.0    27   14.8
9 C.T.       1777    .600    8.32      72   10.839     2268     402    254      5    .143    57.4     36     .7     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.8     34    5.9
1 IDLE        105    .500   10.48      79   11.093     2087      21    190      5    .232     4.9     44    1.1     0   16.6
2 30 PCT T     50    .150   13.39     532   13.594     8573      34    192    112    .077     2.6     15    8.6    27   14.8
3 60 PCT T     67    .780   14.25    1196   15.102    13744      66   1434    361    .147     9.7    211   53.1    55    8.9
4 30 PCT T     35    .140   13.44     629   13.618     8573      24    178    130    .077     1.8     14   10.0    27   14.8
5 10 PCT T     34    .120   13.64     263   13.797     6033      16    106     38    .057      .9      6    2.2     9   18.6
6 30 PCT T     29    .150   13.58     665   13.761     8573      20    189    138    .077     1.5     15   10.6    27   14.8
7 90 PCT T     82   2.170   13.59    1169   15.849    19233     107   5319    471    .113    12.1    601   53.2    81    3.0
8 30 PCT T     31    .180   13.71     754   13.923     8573      21    224    154    .077     1.6     17   11.9    27   14.8
9 C.T.       1716    .620    8.54      72   11.013     2268     382    258      5    .143    54.6     37     .7     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.4     37    5.8
1 IDLE         97    .900   11.07     106   12.075     2087      18    314      6    .232     4.2     73    1.4     0   16.6
2 30 PCT T     36    .200   13.64     661   13.879     8573      24    250    136    .077     1.8     19   10.4    27   14.8
3 60 PCT T     51    .620   14.31    1211   14.985    13744      51   1149    369    .147     7.4    169   54.2    55    8.9
4 30 PCT T     32    .200   13.69     734   13.925     8573      21    249    150    .077     1.6     19   11.6    27   14.8
5 10 PCT T     25    .130   13.86     299   14.017     6033      12    113     43    .057      .7      6    2.4     9   18.6
6 30 PCT T     30    .180   13.65     716   13.862     8573      20    225    147    .077     1.5     17   11.3    27   14.8
7 90 PCT T     97   2.300   13.43    1112   15.835    19233     127   5643    448    .113    14.4    638   50.7    81    3.0
8 30 PCT T     39    .180   13.77     769   13.992     8573      26    223    156    .077     2.0     17   12.0    27   14.8
9 C.T.       1680    .600    8.61      71   11.024     2268     373    249      5    .143    53.4     36     .7     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.3     38    5.9
1 IDLE         97    .900   11.07     106   12.075     2087      18    314      6    .232     4.2     73    1.4     0   16.6
2 30 PCT T     44    .160   13.49     603   13.698     8573      30    202    125    .077     2.3     16    9.6    27   14.8
3 60 PCT T     51    .400   14.32    1259   14.775    13744      51    752    389    .147     7.5    110   57.2    55    8.9
4 30 PCT T     27    .170   13.66     723   13.859     8573      18    212    148    .077     1.4     16   11.4    27   14.8
5 10 PCT T     28    .120   13.78     289   13.930     6033      13    105     42    .057      .7      6    2.4     9   18.6
6 30 PCT T     34    .170   13.60     683   13.807     8573      23    213    141    .077     1.8     16   10.8    27   14.8
7 90 PCT T     93   2.270   13.46    1131   15.830    19233     122   5571    456    .113    13.8    630   51.6    81    3.0
8 30 PCT T     37    .170   13.70     759   13.910     8573      25    212    155    .077     1.9     16   12.0    27   14.8
9 C.T.       1649    .560    8.68      69   11.021     2268     366    233      5    .143    52.4     33     .7     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.3     35    6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     3.6     35    5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     3.3     37    6.0
FOUR CYCLE COMPOSITE -
                                         HC- NDIR 0.35(     3.6) + 0.65(     3.3) =    3.421   GM/BHP HR
                                         CO- NDIR 0.35(    35.4) + 0.65(    36.5) =   36.153   GM/BHP HR
                                         NO2-NDIR 0.35(     5.8) + 0.65(     6.0) =    5.913   GM/BHP HR
                                                              CORRECTED NO2 =    6.234   GM/BHP HR
                                                                       BSFC =     .673   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC     CO    NO2    FACT.  HC-FID    CO  NO2-CL   HP   VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE       1707    .500   10.48      40   11.151     2087      32    189      2    .232     7.4     44     .6     0   16.6
2 30 PCT T    731    .160   13.29     500   13.523     8573      46    205    105    .077     3.6     16    8.1    27   14.8
3 60 PCT T   1679    .640   14.34    1225   15.148    13744     152   1173    369    .147    22.4    172   54.2    55    8.9
4 30 PCT T    465    .150   13.52     615   13.717     8573      29    189    128    .077     2.2     15    9.8    27   14.8
5 10 PCT T    219    .130   13.51     210   13.662     6033      10    116     31    .057      .5      7    1.8     9   18.6
6 30 PCT T    401    .150   13.47     590   13.660     8573      25    190    123    .077     1.9     15    9.5    27   14.8
7 90 PCT T   2218   2.060   13.58    1113   15.862    19233     269   5046    448    .113    30.4    570   50.6    81    3.0
8 30 PCT T    366    .150   13.58     670   13.767     8573      23    189    139    .077     1.8     15   10.7    27   14.8
9 C.T.      20351    .600    8.32      20   10.955     2268     421    251      1    .143    60.2     36     .2     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.0     34    5.6
1 IDLE       1707    .500   10.48      40   11.151     2087      32    189      2    .232     7.4     44     .6     0   16.6
2 30 PCT T    562    .150   13.39     515   13.596     8573      36    192    108    .077     2.7     15    8.3    27   14.8
3 60 PCT T   1452    .780   14.25    1163   15.175    13744     132   1427    350    .147    19.3    210   51.4    55    8.9
4 30 PCT T    366    .140   13.44     610   13.617     8573      23    178    128    .077     1.8     14    9.8    27   14.8
5 10 PCT T    191    .120   13.64     235   13.779     6033       8    106     34    .057      .5      6    1.9     9   18.6
6 30 PCT T    353    .150   13.58     620   13.765     8573      22    189    128    .077     1.7     15    9.9    27   14.8
7 90 PCT T   2206   2.170   13.59    1125   15.981    19233     265   5276    450    .113    30.0    596   50.8    81    3.0
8 30 PCT T    367    .180   13.71     730   13.927     8573      23    224    149    .077     1.7     17   11.5    27   14.8
9 C.T.      20610    .620    8.54      30   11.221     2268     417    253      2    .143    59.6     36     .3     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.8     36    5.5
1 IDLE       1860    .900   11.07      65   12.156     2087      32    312      4    .232     7.4     72     .9     0   16.6
2 30 PCT T    705    .200   13.64     640   13.911     8573      43    249    131    .077     3.3     19   10.1    27   14.8
3 60 PCT T   1252    .620   14.31    1213   15.055    13744     114   1143    368    .147    16.8    168   54.0    55    8.9
4 30 PCT T    445    .200   13.69     715   13.934     8573      27    249    146    .077     2.1     19   11.2    27   14.8
5 10 PCT T    204    .130   13.86     270   14.010     6033       9    113     39    .057      .5      6    2.2     9   18.6
6 30 PCT T    416    .180   13.65     700   13.872     8573      26    225    144    .077     2.0     17   11.1    27   14.8
7 90 PCT T   2176   2.300   13.43    1100   15.948    19233     262   5603    440    .113    29.7    633   49.7    81    3.0
8 30 PCT T    367    .180   13.77     740   13.987     8573      22    223    151    .077     1.7     17   11.6    27   14.8
9 C.T.      20402    .600    8.61      30   11.250     2268     411    244      2    .143    58.8     35     .3     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.7     38    5.8
1 IDLE       1860    .900   11.07      65   12.156     2087      32    312      4    .232     7.4     72     .9     0   16.6
2 30 PCT T    619    .160   13.49     590   13.712     8573      39    202    122    .077     3.0     16    9.4    27   14.8
3 60 PCT T    966    .400   14.32    1250   14.817    13744      90    750    386    .147    13.2    110   56.6    55    8.9
4 30 PCT T    416    .170   13.66     710   13.872     8573      26    212    146    .077     2.0     16   11.2    27   14.8
5 10 PCT T    204    .120   13.78     265   13.920     6033       9    105     38    .057      .5      6    2.2     9   18.6
6 30 PCT T    366    .170   13.60     675   13.807     8573      23    213    139    .077     1.8     16   10.7    27   14.8
7 90 PCT T   2162   2.270   13.46    1100   15.946    19233     261   5531    440    .113    29.5    625   49.7    81    3.0
8 30 PCT T    338    .170   13.70     745   13.904     8573      21    212    153    .077     1.6     16   11.7    27   14.8
9 C.T.      19973    .560    8.68      30   11.237     2268     403    228      2    .143    57.6     33     .3     0   24.1
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.5     35    5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     4.9     35    5.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     4.6     36    5.8
FOUR CYCLE COMPOSITE -
                                         HC- FID  0.35(     4.9) + 0.65(     4.6) =    4.676   GM/BHP HR
                                         CO- NDIR 0.35(    35.2) + 0.65(    36.3) =   35.912   GM/BHP HR
                                         NO2-CL   0.35(     5.5) + 0.65(     5.8) =    5.718   GM/BHP HR
                                                              CORRECTED NO2 =    6.029   GM/BHP HR
                                                                       BSFC =     .673   LB/BHP HR
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TABLE C-35. MASS EMISSIONS BY NINE-MODE EPA

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ENGINE 3-0   TEST 71  RUN-3   1973 STANDARD ENGINE  08-14-73     X #1,070     HUM #101.7  GR/LB
-----------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE           HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2   FACT.   HC       CO     NO2    HP   VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         85    .380   10.03     72   10.502   2087      18     153       5   .232    4.2      35     1.1     0   16.6
2 30 PCT T     47    .150   13.23    505   13.431   8573      32     193     107   .077    2.5      15     8.2    27   14.8
3 60 PCT T     66    .600   14.33   1241   15.001  13744      65    1110     377   .147    9.6     163    55.5    55    8.9
4 30 PCT T     26    .150   13.43    612   13.608   8573      18     191     128   .077    1.4      15     9.9    27   14.8
5 10 PCT T     19    .130   13.48    297   13.631   6033       9     116      35   .057     .5       7     2.0     9   18.6
6 30 PCT T     27    .150   13.43    638   13.609   8573      18     191     133   .077    1.4      15    10.3    27   14.8
7 90 PCT T     85   1.990   13.65   1203   15.732  19233     112    4914     488   .113   12.7     555    55.2    81    3.0
8 30 PCT T     29    .160   13.57    669   13.761   8573      20     201     138   .077    1.5      16    10.7    27   14.8
9 C.T.       1779    .580    8.27     71   10.771   2268     405     247       5   .143   57.9      35      .7     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   3.5      33     5.9
1 IDLE         85    .380   10.03     72   10.502   2087      18     153       5   .232    4.2      35     1.1     0   16.6
2 30 PCT T     38    .150   13.31    565   13.501   8573      26     192     119   .077    2.0      15     9.2    27   14.8
3 60 PCT T     64    .720   14.21   1219   14.999  13744      63    1333     371   .147    9.3     196    54.5    55    8.9
4 30 PCT T     30    .150   13.39    645   13.572   8573      20     191     135   .077    1.6      15    10.4    27   14.8
5 10 PCT T     27    .130   13.52    269   13.679   6033      13     116      39   .057     .7       7     2.2     9   18.6
6 30 PCT T     30    .170   13.52    671   13.722   8573      20     215     139   .077    1.6      17    10.7    27   14.8
7 90 PCT T     82   1.960   13.58   1167   15.629  19233     109    4872     477   .113   12.3     551    53.9    81    3.0
8 30 PCT T     23    .170   13.60    753   13.795   8573      15     213     155   .077    1.2      16    12.0    27   14.8
9 C.T.       1657    .570    8.59     72   10.950   2268     371     238       5   .143   53.0      34      .7     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   3.3      34     5.9
1 IDLE         74    .540   11.41    103   12.030   2087      14     189       6   .232    3.2      44     1.4     0   16.6
2 30 PCT T     30    .190   13.58    653   13.802   8573      20     238     135   .077    1.5      18    10.4    27   14.8
3 60 PCT T     47    .570   14.31   1204   14.931  13744      47    1060     368   .147    6.9     156    54.1    55    8.9
4 30 PCT T     29    .190   13.75    731   13.971   8573      19     236     149   .077    1.5      18    11.5    27   14.8
5 10 PCT T     28    .140   13.84    299   14.010   6033      13     122      43   .057     .7       7     2.4     9   18.6
6 30 PCT T     31    .180   13.71    698   13.923   8573      21     224     143   .077    1.6      17    11.0    27   14.8
7 90 PCT T     85   2.110   13.56   1150   15.762  19233     112    5201     466   .113   12.7     588    52.6    81    3.0
8 30 PCT T     24    .190   13.75    767   13.966   8573      16     236     156   .077    1.2      18    12.0    27   14.8
9 C.T.       1664    .590    8.64     73   11.027   2268     370     245       5   .143   52.9      35      .7     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   3.1      34     6.0
1 IDLE         74    .540   11.41    103   12.030   2087      14     189       6   .232    3.2      44     1.4     0   16.6
2 30 PCT T     31    .180   13.57    624   13.783   8573      21     226     129   .077    1.6      17     9.9    27   14.8
3 60 PCT T     43    .530   14.29   1254   14.866  13744      43     990     385   .147    6.3     145    56.6    55    8.9
4 30 PCT T     21    .190   13.65    748   13.863   8573      14     237     154   .077    1.1      18    11.8    27   14.8
5 10 PCT T     17    .130   13.75    314   13.898   6033       8     114      45   .057     .5       6     2.6     9   18.6
6 30 PCT T     24    .170   13.63    755   13.826   8573      16     213     155   .077    1.2      16    12.0    27   14.8
7 90 PCT T     79   2.040   13.56   1185   15.685  19233     105    5053     482   .113   11.8     571    54.5    81    3.0
8 30 PCT T     27    .170   13.64    788   13.839   8573      18     213     162   .077    1.4      16    12.5    27   14.8
9 C.T.       1670    .560    8.59    100   10.954   2268     373     234       7   .143   53.4      33     1.0     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   3.1      33     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------   3.4      33     5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------   3.1      34     6.1
FOUR CYCLE COMPOSITE -                HC- NDIR 0.35(     3.4) + 0.65(     3.1) =    3.210   GM/BHP HR
                                      CO- NDIR 0.35(    33.3) + 0.65(    33.8) =   33.646   GM/BHP HR
                                      NO2-NDIR 0.35(     5.9) + 0.65(     6.1) =    6.019   GM/BHP HR
                                                            CORRECTED NO2 =    6.437   GM/BHP HR
                                                                     BSFC =     .673   LB/BHP HR


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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE         HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL  HP   VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE       1507    .380   10.03     40   10.561   2087      30     152       3   .232    6.9      35      .6     0   16.6
2 30 PCT T    759    .150   13.23    470   13.456   8573      48     193      94   .077    3.7      15     7.2    27   14.8
3 60 PCT T   1650    .600   14.33   1213   15.095  13744     150    1104     367   .147   22.1     162    53.9    55    8.9
4 30 PCT T    472    .150   13.43    595   13.627   8573      30     191     124   .077    2.3      15     9.6    27   14.8
5 10 PCT T    232    .130   13.48    210   13.633   6033      10     116      31   .057     .6       7     1.8     9   18.6
6 30 PCT T    422    .150   13.43    615   13.622   8573      27     191     128   .077    2.0      15     9.9    27   14.8
7 90 PCT T   2232   1.990   13.65   1150   15.863  19233     271    4874     463   .113   30.6     551    52.3    81    3.0
8 30 PCT T    380    .160   13.57    630   13.768   8573      24     201     130   .077    1.8      15    10.0    27   14.8
9 C.T.      20772    .580    8.27     20   10.927   2268     431     243       1   .143   61.7      35      .2     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   5.0      32     5.6
1 IDLE       1507    .380   10.03     40   10.561   2087      30     152       3   .232    6.9      35      .6     0   16.6
2 30 PCT T    618    .150   13.31    555   13.522   8573      39     192     117   .077    3.0      15     9.0    27   14.8
3 60 PCT T   1394    .720   14.21   1187   15.069  13744     127    1326     359   .147   18.7     195    52.8    55    8.9
4 30 PCT T    380    .150   13.39    625   13.578   8573      24     191     131   .077    1.8      15    10.1    27   14.8
5 10 PCT T    218    .130   13.52    240   13.672   6033      10     116      35   .057     .6       7     2.0     9   18.6
6 30 PCT T    381    .170   13.52    650   13.728   8573      24     214     135   .077    1.8      17    10.4    27   14.8
7 90 PCT T   2173   1.960   13.58   1150   15.757  19233     265    4833     466   .113   30.0     546    52.7    81    3.0
8 30 PCT T    352    .170   13.60    720   13.805   8573      22     213     148   .077    1.7      16    11.4    27   14.8
9 C.T.      20827    .570    8.59     20   11.243   2268     420     232       1   .143   60.1      33      .2     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   4.8      34     5.7
1 IDLE       1610    .540   11.41     60   12.111   2087      28     188       3   .232    6.4      44      .8     0   16.6
2 30 PCT T    733    .190   13.58    630   13.843   8573      45     238     130   .077    3.5      18    10.0    27   14.8
3 60 PCT T   1166    .570   14.31   1200   14.997  13744     107    1055     365   .147   15.7     155    53.7    55    8.9
4 30 PCT T    466    .190   13.75    710   13.987   8573      29     235     144   .077    2.2      18    11.1    27   14.8
5 10 PCT T    226    .140   13.84    265   14.003   6033      10     122      38   .057     .6       7     2.2     9   18.6
6 30 PCT T    423    .180   13.71    680   13.932   8573      26     224     139   .077    2.0      17    10.7    27   14.8
7 90 PCT T   2296   2.110   13.56   1125   15.895  19233     272    5157     452   .113   30.7     583    51.1    81    3.0
8 30 PCT T    409    .190   13.75    750   13.981   8573      25     235     153   .077    1.9      18    11.8    27   14.8
9 C.T.      20839    .590    8.64     20   11.314   2268     418     239       1   .143   59.7      34      .2     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   4.7      34     5.8
1 IDLE       1610    .540   11.41     60   12.111   2087      28     188       3   .232    6.4      44      .8     0   16.6
2 30 PCT T    676    .180   13.57    600   13.818   8573      42     226     124   .077    3.2      17     9.5    27   14.8
3 60 PCT T   1137    .530   14.29   1200   14.934  13744     105     985     367   .147   15.4     145    53.9    55    8.9
4 30 PCT T    451    .190   13.65    700   13.885   8573      28     237     143   .077    2.1      18    11.0    27   14.8
5 10 PCT T    219    .130   13.75    255   13.902   6033       9     114      37   .057     .5       6     2.1     9   18.6
6 30 PCT T    430    .170   13.63    710   13.843   8573      27     213     146   .077    2.0      16    11.2    27   14.8
7 90 PCT T   2231   2.040   13.56   1150   15.823  19233     271    5009     464   .113   30.6     566    52.4    81    3.0
8 30 PCT T    380    .170   13.64    730   13.848   8573      24     213     150   .077    1.8      16    11.6    27   14.8
9 C.T.      21259    .560    8.59     20   11.276   2268     428     228       1   .143   61.1      33      .2     0   24.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------   4.7      33     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------   4.9      33     5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------   4.7      34     5.8
FOUR CYCLE COMPOSITE -                HC- FID  0.35(     4.9) + 0.65(     4.7) =    4.774   GM/BHP HR
                                      CO- NDIR 0.35(    33.0) + 0.65(    33.6) =   33.388   GM/BHP HR
                                      NO2-CL   0.35(     5.6) + 0.65(     5.8) =    5.756   GM/BHP HR
                                                            CORRECTED NO2 =    6.156   GM/BHP HR
                                                                     BSFC =     .673   LB/BHP HR
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                              TABLE C-3, MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-1    TEST 9D  RUN 1   EGR-CAT-2-AIR          09-07-73       K =1.069      HUM =101.3  GR/LB
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                CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR        WT.       WEIGHTED GM/HR                 MAN.
MODE             HC      CO     CO2     NO    CARBON    CONS.      HC      CO       NO2   FACT.    HC          CO    NO2     HP      VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE           12    .050    8.34     83     8.403     2313       4      28         8    .232     .8          6     1.8      0     15.0
2 30 PCT T       13    .060    9.29    178     9.364     9163      14     119        58    .077    1.1          9     4.5     24     12.4
3 60 PCT T       10    .060   11.68    410    11.751    14152      13     196       164    .147    1.9         21    24.1     48      7.2
4 30 PCT T       10    .060    9.25    232     9.321     9163      11     119        76    .077     .8          9     5.8     24     12.4
5 10 PCT T       10    .060    8.31    110     8.381     6759       9      98        29    .057     .5          6     1.7      8     16.2
6 30 PCT T       11    .060    9.25    220     9.322     9163      12     119        72    .077     .9          9     5.5     24     12.4
7 90 PCT T       11    .100   13.06    608    13.172    18915      13     290       290    .113    1.4         33    32.4     72      2.3
8 30 PCT T       10    .060    9.24    238     9.311     9163      11     119        78    .077     .8          9     6.0     24     12.4
9 C.T.           41    .070    5.19     48     5.293     2404      15      64         7    .143    2.2          9     1.0      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .5          5     3.6
1 IDLE           12    .050    8.34     83     8.403     2313       4      28         8    .232     .9          6     1.8      0     15.0
2 30 PCT T       13    .070    9.18    179     9.269     9163      14     140        59    .077    1.1         11     4.5     24     12.4
3 60 PCT T       12    .070   11.82    409    11.903    14152      15     168       159    .147    2.3         25    23.4     48      7.2
4 30 PCT T       12    .060    9.15    209     9.223     9163      13     120        69    .077    1.0          9     5.3     24     12.4
5 10 PCT T       11    .060    8.37    111     8.442     6759      10      97        30    .057     .6          6     1.7      8     16.2
6 30 PCT T       13    .060    9.06    182     9.134     9163      14     122        61    .077    1.1          9     4.7     24     12.4
7 90 PCT T       13    .080   13.21    538    13.304    18915      20     230       254    .113    2.3         26    28.7     72      2.3
8 30 PCT T       11    .070    9.31    247     9.392     9163      12     138        80    .077     .9         11     6.2     24     12.4
9 C.T.           28    .070    5.24     46     5.340     2404      14      64         7    .143    1.9          9     1.0      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .5          5     3.4
1 IDLE           13    .040    8.53    106     8.584     2313       4      22         9    .232     .9          5     2.2      0     15.0
2 30 PCT T       15    .060    9.38    219     9.456     9163      16     117        70    .077    1.2          9     5.4     24     12.4
3 60 PCT T       13    .070   11.63    436    11.714    14152      17     171       175    .147    2.5         25    25.7     48      7.2
4 30 PCT T       13    .080    9.25    245     9.344     9163      14     158        80    .077    1.1         12     6.1     24     12.4
5 10 PCT T       12    .070    8.51    127     8.593     6759      10     111        33    .057     .6          6     1.9      8     16.2
6 30 PCT T       13    .060    9.31    245     9.384     9163      14     118        79    .077    1.1          9     6.1     24     12.4
7 90 PCT T       12    .090   13.91    528    14.013    18915      17     245       237    .113    2.0         28    26.7     72      2.3
8 30 PCT T       11    .060    9.34    281     9.462     9163      12     117        90    .077     .9          9     7.0     24     12.4
9 C.T.           28    .070    5.20     47     5.300     2404      14      64         7    .143    2.0          9     1.0      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .5          5     3.6
1 IDLE           13    .040    8.53    106     8.584     2313       4      22         9    .232     .9          5     2.2      0     15.0
2 30 PCT T       15    .060    9.46    234     9.536     9163      16     116        75    .077    1.2          9     5.7     24     12.4
3 60 PCT T       13    .050   11.50    443    11.564    14152      17     124       180    .147    2.5         18    26.5     48      7.2
4 30 PCT T       12    .050    9.43    274     9.493     9163      13      97        88    .077    1.0          8     6.8     24     12.4
5 10 PCT T       11    .050    8.61    139     8.672     6759       9      79        36    .057     .5          4     2.1      8     16.2
6 30 PCT T       13    .060    9.48    276     9.520     9163      14     117        89    .077    1.0          9     6.8     24     12.4
7 90 PCT T       14    .070   13.21    550    13.295    18915      22     201       260    .113    2.4         23    29.4     72      2.3
8 30 PCT T       13    .050    9.43    280     9.494     9163      14      97        90    .077    1.0          8     6.9     24     12.4
9 C.T.           27    .050    5.27     48     5.349     2404      13      45         7    .143    1.9          6     1.0      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .5          4     3.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     .5          5     3.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     .5          4     3.7
FOUR CYCLE COMPOSITE -                      HC= NDIR 0.35(     .5) + 0.65(     .5) =      .500   GM/BHP HR
                                            CO= NDIR 0.35(    4.9) + 0.65(    4.4) =     4.560   GM/BHP HR
                                            NO2-NDIR 0.35(    3.5) + 0.65(    3.7) =     3.608   GM/BHP HR
                                                               CORRECTED NO2 =     3.856   GM/BHP HR
                                                                        BSFC =      .795   LB/BHP HR


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                CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR        WT.       WEIGHTED GM/HR                 MAN.
MODE            HC-FID    CO     CO2   NO-CL  CARBON    CONS.      HC      CO       NO2   FACT.  HC-FID        CO   NO2-CL   HP      VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE           41    .050    8.34     65     8.394     2313       1      28         6    .232     .3          6     1.4      0     15.0
2 30 PCT T       75    .060    9.29    160     9.357     9163       7     119        52    .077     .6          9     4.0     24     12.4
3 60 PCT T       24    .060   11.68    370    11.742    14152       3     196       148    .147     .4         21    21.8     48      7.2
4 30 PCT T       27    .060    9.25    200     9.313     9163       3     119        65    .077     .2          9     5.0     24     12.4
5 10 PCT T       33    .060    8.31     70     8.373     6759       3      98        19    .057     .2          6     1.1      8     16.2
6 30 PCT T       37    .060    9.25    190     9.314     9163       4     119        62    .077     .3          9     4.8     24     12.4
7 90 PCT T       15    .100   13.06    560    13.161    18915       2     290       267    .113     .2         33    30.2     72      2.3
8 30 PCT T       14    .060    9.24    200     9.301     9163       1     119        65    .077     .1          9     5.0     24     12.4
9 C.T.          347    .070    5.19     10     5.295     2404      16      64         2    .143    2.3          9      .2      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .2          5     3.2
1 IDLE           41    .050    8.34     65     8.394     2313       1      28         6    .232     .3          6     1.4      0     15.0
2 30 PCT T       41    .070    9.18    160     9.254     9163       4     140        53    .077     .3         11     4.0     24     12.4
3 60 PCT T       18    .070   11.82    365    11.892    14152       2     168       144    .147     .3         25    21.2     48      7.2
4 30 PCT T       21    .060    9.15    180     9.212     9163       2     121        59    .077     .2          9     4.6     24     12.4
5 10 PCT T       24    .060    8.37     80     8.432     6759       2      97        21    .057     .1          6     1.2      8     16.2
6 30 PCT T       34    .060    9.06    150     9.124     9163       3     122        50    .077     .3          9     3.9     24     12.4
7 90 PCT T       10    .080   13.21    490    13.291    18915       1     230       232    .113     .2         26    26.2     72      2.3
8 30 PCT T       10    .070    9.31    215     9.381     9163       1     138        70    .077     .1         11     5.4     24     12.4
9 C.T.          295    .070    5.24     10     5.339     2404      13      64         1    .143    1.9          9      .2      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .2          5     3.0
1 IDLE           21    .040    8.53     80     8.572     2313       1      22         7    .232     .1          5     1.7      0     15.0
2 30 PCT T       41    .060    9.38    205     9.444     9163       4     118        66    .077     .3          9     5.1     24     12.4
3 60 PCT T       18    .070   11.63    410    11.702    14152       2     171       165    .147     .3         25    24.2     48      7.2
4 30 PCT T       21    .080    9.25    215     9.332     9163       2     159        70    .077     .2         12     5.4     24     12.4
5 10 PCT T       24    .070    8.51     90     8.582     6759       2     111        24    .057     .1          6     1.3      8     16.2
6 30 PCT T       33    .060    9.31    220     9.373     9163       3     118        71    .077     .2          9     5.5     24     12.4
7 90 PCT T       10    .090   13.91    485    14.001    18915       1     246       218    .113     .2         28    24.6     72      2.3
8 30 PCT T       10    .060    9.39    250     9.451     9163       1     118        80    .077     .1          9     6.2     24     12.4
9 C.T.          295    .070    5.20     10     5.294     2404      13      64         2    .143    1.9          9      .2      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .1          5     3.2
1 IDLE           21    .040    8.53     80     8.572     2313       1      22         7    .232     .1          5     1.7      0     15.0
2 30 PCT T       45    .060    9.46    215     9.524     9163       4     117        69    .077     .3          9     5.3     24     12.4
3 60 PCT T       14    .050   11.50    410    11.552    14152       2     124       167    .147     .3         18    24.5     48      7.2
4 30 PCT T       17    .050    9.43    245     9.482     9163       2      98        79    .077     .1          8     6.1     24     12.4
5 10 PCT T       24    .050    8.61    105     8.662     6759       2      79        27    .057     .1          4     1.6      8     16.2
6 30 PCT T       40    .060    9.45    250     9.513     9163       3     117        80    .077     .2          9     6.2     24     12.4
7 90 PCT T       10    .070   13.21    505    13.281    18915       1     201       239    .113     .2         23    27.0     72      2.3
8 30 PCT T       10    .050    9.43    245     9.481     9163       1      98        79    .077     .1          8     6.1     24     12.4
9 C.T.          289    .050    5.27     10     5.349     2404      13      45         1    .143    1.9          6      .2      0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     .1          4     3.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     .2          5     3.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     .1          4     3.3
FOUR CYCLE COMPOSITE -                      HC= FID  0.35(     .2) + 0.65(     .1) =      .155   GM/BHP HR
                                            CO= NDIR 0.35(    4.9) + 0.65(    4.4) =     4.564   GM/BHP HR
                                            NO2-CL   0.35(    3.1) + 0.65(    3.3) =     3.228   GM/BHP HR
                                                               CORRECTED NO2 =     3.449   GM/BHP HR
                                                                        BSFC =      .795   LB/BHP HR
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TABLE C-37, MASS EMISSIONS BY NINE-MODE EPA

ENGINE 3-1 TEST 90 RUN 2 EGR-CAT-2-AIR 09-07-73 K =1.068 HUM =101.0 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	23	.040	8.16	66	8.225	2313	7	23	6	.232	1.6	5	1.4	0	15.0
2 30 PCT T	24	.030	8.98	156	9.036	9163	26	61	53	.077	2.0	5	4.0	24	12.9
3 60 PCT T	19	.030	11.47	391	11.521	14152	25	74	159	.147	3.7	11	23.4	48	7.2
4 30 PCT T	18	.030	9.09	222	9.139	9163	19	61	74	.077	1.5	5	5.7	24	12.9
5 10 PCT T	19	.030	8.21	109	8.261	6759	17	50	30	.057	1.0	3	1.7	8	16.2
6 30 PCT T	19	.020	9.16	233	9.201	9163	20	40	77	.077	1.6	3	5.9	24	12.9
7 90 PCT T	18	.050	12.75	638	12.819	18915	29	149	313	.113	3.2	17	35.3	72	2.3
8 30 PCT T	17	.020	9.10	231	9.138	9163	18	41	77	.077	1.4	3	5.9	24	12.9
9 C.T.	60	.020	5.07	42	5.155	2909	30	19	7	.143	4.3	3	.9	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.9	2	3.7		
1 IDLE	23	.040	8.16	66	8.225	2313	7	23	6	.232	1.6	5	1.4	0	15.0
2 30 PCT T	20	.030	9.00	170	9.052	9163	22	61	57	.077	1.7	5	4.4	24	12.9
3 60 PCT T	18	.030	11.74	386	11.789	14152	23	73	154	.147	3.4	11	22.6	48	7.2
4 30 PCT T	17	.020	9.05	216	9.088	9163	19	41	72	.077	1.4	3	5.6	24	12.9
5 10 PCT T	18	.030	8.19	108	8.239	6759	16	50	29	.057	.9	3	1.7	8	16.2
6 30 PCT T	19	.030	9.12	235	9.171	9163	21	61	78	.077	1.6	5	6.0	24	12.9
7 90 PCT T	19	.080	12.99	545	13.091	18915	30	234	261	.113	3.4	26	29.5	72	2.3
8 30 PCT T	18	.020	9.25	266	9.289	9163	19	40	87	.077	1.5	3	6.7	24	12.9
9 C.T.	51	.500	5.12	44	5.675	2909	23	428	6	.143	3.3	61	.9	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.8	5	3.4		
1 IDLE	20	.030	8.26	106	8.312	2313	6	17	10	.232	1.4	4	2.3	0	15.0
2 30 PCT T	22	.030	9.28	230	9.334	9163	23	59	75	.077	1.8	5	5.8	24	12.9
3 60 PCT T	20	.030	11.39	457	11.442	14152	27	75	188	.147	3.9	11	27.6	48	7.2
4 30 PCT T	20	.030	9.24	270	9.292	9163	21	60	88	.077	1.6	5	6.8	24	12.9
5 10 PCT T	20	.030	8.33	128	8.382	6759	17	49	34	.057	1.0	3	2.0	8	16.2
6 30 PCT T	20	.030	9.29	267	9.342	9163	21	59	87	.077	1.6	5	6.7	24	12.9
7 90 PCT T	20	.030	12.96	584	13.012	18915	31	88	282	.113	3.5	10	31.8	72	2.3
8 30 PCT T	20	.030	9.17	259	9.222	9163	21	60	85	.077	1.7	5	6.6	24	12.9
9 C.T.	52	.020	5.15	47	5.226	2909	26	19	7	.143	3.7	3	1.0	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.9	2	3.9		
1 IDLE	20	.030	8.26	106	8.312	2313	6	17	10	.232	1.4	4	2.3	0	15.0
2 30 PCT T	23	.030	9.09	199	9.145	9163	25	61	66	.077	1.9	5	5.1	24	12.9
3 60 PCT T	21	.030	11.44	445	11.493	14152	28	75	182	.147	4.1	11	26.7	48	7.2
4 30 PCT T	20	.030	9.19	256	9.242	9163	21	60	84	.077	1.6	5	6.5	24	12.9
5 10 PCT T	19	.030	8.36	142	8.411	6759	16	49	38	.057	.9	3	2.2	8	16.2
6 30 PCT T	20	.030	9.14	246	9.192	9163	22	60	81	.077	1.7	5	6.3	24	12.9
7 90 PCT T	20	.020	12.91	556	12.952	18915	32	59	270	.113	3.6	7	30.5	72	2.3
8 30 PCT T	19	.030	9.18	268	9.231	9163	20	60	88	.077	1.6	5	6.8	24	12.9
9 C.T.	50	.020	5.24	52	5.314	2909	24	18	8	.143	3.5	3	1.1	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.9	2	3.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.9	4	3.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.9	2	3.9		

FOUR CYCLE COMPOSITE =

HC= NDIR 0.35(.9) + 0.65(.9) = .870 GM/BHP HR

CO= NDIR 0.35(3.8) + 0.65(2.0) = 2.667 GM/BHP HR

NO2-NDIR 0.35(3.5) + 0.65(3.9) = 3.750 GM/BHP HR

CORRECTED NO2 = 4.005 GM/BHP HR

BSFC = .795 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	59	.040	8.16	65	8.206	2313	2	23	6	.232	.4	5	1.4	0	15.0
2 30 PCT T	98	.030	8.98	160	9.020	9163	10	62	54	.077	.8	5	4.2	24	12.9
3 60 PCT T	28	.030	11.47	365	11.503	14152	3	75	149	.147	.5	11	21.9	48	7.2
4 30 PCT T	61	.030	9.09	205	9.126	9163	6	61	69	.077	.5	5	5.3	24	12.9
5 10 PCT T	74	.030	8.21	80	8.247	6759	6	50	22	.057	.3	3	1.2	8	16.2
6 30 PCT T	95	.020	9.16	215	9.190	9163	10	40	71	.077	.7	3	5.5	24	12.9
7 90 PCT T	35	.050	12.75	600	12.804	18915	5	149	294	.113	.6	17	33.3	72	2.3
8 30 PCT T	34	.020	9.10	200	9.123	9163	3	41	67	.077	.3	3	5.1	24	12.9
9 C.T.	556	.020	5.07	10	5.146	2909	26	19	2	.143	3.7	3	.2	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.3	2	3.4		
1 IDLE	59	.040	8.16	65	8.206	2313	2	23	6	.232	.4	5	1.4	0	15.0
2 30 PCT T	69	.030	9.00	155	9.037	9163	7	61	52	.077	.5	5	4.0	24	12.9
3 60 PCT T	21	.030	11.74	360	11.772	14152	3	73	144	.147	.4	11	21.1	48	7.2
4 30 PCT T	24	.020	9.05	190	9.072	9163	2	41	64	.077	.2	3	4.9	24	12.9
5 10 PCT T	38	.030	8.19	75	8.223	6759	3	50	20	.057	.2	3	1.2	8	16.2
6 30 PCT T	39	.030	9.12	210	9.154	9163	4	61	70	.077	.3	5	5.4	24	12.9
7 90 PCT T	12	.080	12.99	500	13.071	18915	2	234	240	.113	.2	26	27.1	72	2.3
8 30 PCT T	15	.020	9.25	235	9.272	9163	2	40	77	.077	.1	3	5.9	24	12.9
9 C.T.	487	.500	5.12	10	5.669	2909	21	428	1	.143	3.0	61	.2	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.2	5	3.1		
1 IDLE	30	.030	8.26	80	8.293	2313	1	17	7	.232	.2	4	1.7	0	15.0
2 30 PCT T	64	.030	9.28	210	9.316	9163	6	60	69	.077	.5	5	5.3	24	12.9
3 60 PCT T	24	.030	11.39	415	11.422	14152	3	75	171	.147	.4	11	25.1	48	7.2
4 30 PCT T	25	.030	9.24	240	9.272	9163	2	60	79	.077	.2	5	6.1	24	12.9
5 10 PCT T	33	.030	8.33	95	8.363	6759	3	49	25	.057	.2	3	1.5	8	16.2
6 30 PCT T	40	.030	9.29	240	9.324	9163	4	60	78	.077	.3	5	6.0	24	12.9
7 90 PCT T	13	.030	12.96	535	12.991	18915	2	88	259	.113	.2	10	29.2	72	2.3
8 30 PCT T	15	.030	9.17	230	9.202	9163	2	60	76	.077	.1	5	5.9	24	12.9
9 C.T.	452	.020	5.15	10	5.215	2909	21	19	2	.143	3.0	3	.2	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.2	2	3.5		
1 IDLE	30	.030	8.26	80	8.293	2313	1	17	7	.232	.2	4	1.7	0	15.0
2 30 PCT T	63	.030	9.09	190	9.126	9163	6	61	63	.077	.5	5	4.9	24	12.9
3 60 PCT T	24	.030	11.44	405	11.472	14152	3	75	166	.147	.4	11	24.4	48	7.2
4 30 PCT T	27	.030	9.19	200	9.223	9163	3	60	66	.077	.2	5	5.1	24	12.9
5 10 PCT T	33	.030	8.36	95	8.393	6759	3	49	25	.057	.2	3	1.4	8	16.2
6 30 PCT T	40	.030	9.14	215	9.174	9163	4	61	71	.077	.3	5	5.5	24	12.9
7 90 PCT T	13	.020	12.91	510	12.931	18915	2	59	248	.113	.2	7	28.0	72	2.3
8 30 PCT T	15	.030	9.18	225	9.212	9163	2	60	74	.077	.1	5	5.7	24	12.9
9 C.T.	439	.020	5.24	10	5.304	2909	20	18	2	.143	2.8	3	.2	0	23.3
CYCLE COMPOSITE IN GM/BHP HR											.2	2	3.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.3	4	3.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.2	2	3.4		

FOUR CYCLE COMPOSITE =

HC= FID 0.35(.3) + 0.65(.2) = .240 GM/BHP HR

CO= NDIR 0.35(3.8) + 0.65(2.0) = 2.672 GM/BHP HR

NO2-CL 0.35(3.2) + 0.65(3.4) = 3.361 GM/BHP HR

CORRECTED NO2 = 3.590 GM/BHP HR

BSFC = .795 LB/BHP HR

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                              TABLE  C-38.MASS EMISSIONS BY NINE-MODE EPA
ENGINE-3-1X  TEST-41  RUN-5   EGR-CAT-2-AIR            09-11-73      K =1.100      HUM =120.9  GR/LB
------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED      TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR               MAN.
MODE             HC       CO      CO2     NO    CARBON    CONS.       HC       CO      NO2    FACT.    HC         CO     NO2      HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE           94     .020     7.49     76     7.612     2177       29       12        7    .232     6.7         3     1.7       0    15.4
2 30 PCT T       25     .020     9.19    201     9.177     9117       27       40       66    .077     2.1         3     5.1      24    13.4
3 60 PCT T       21     .030    11.79    427    11.843    14697       28       75      174    .147     4.1        11    25.4      48     7.2
4 30 PCT T       20     .030     9.31    286     9.362     9117       21       59       92    .077     1.6         5     7.1      24    13.4
5 10 PCT T       18     .020     8.44    153     8.479     6713       15       32       40    .057      .9         2     2.3       8    16.9
6 30 PCT T       20     .020     9.29    273     9.332     9117       21       39       89    .077     1.6         3     6.8      24    13.4
7 90 PCT T       19     .060    13.31    541    13.391    19187       29      174      257    .113     3.3        20    29.1      72     2.5
8 30 PCT T       18     .020     9.26    282     9.299     9117       19       40       92    .077     1.5         3     7.1      24    13.4
9 C.T.           55     .030     9.56     51     9.649     2313       30       30        8    .143     4.2         4     1.2       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.1         2     3.7
1 IDLE           94     .020     7.49     76     7.612     2177       29       12        7    .232     6.7         3     1.7       0    15.4
2 30 PCT T       21     .020     9.19    217     9.183     9117       23       40       72    .077     1.7         3     5.5      24    13.4
3 60 PCT T       19     .020    11.62    440    11.661    14697       26       51      184    .147     3.8         7    27.1      48     7.2
4 30 PCT T       17     .030     9.15    276     9.198     9117       18       60       91    .077     1.4         5     7.0      24    13.4
5 10 PCT T       18     .020     8.25    137     8.289     6713       16       33       37    .057      .9         2     2.1       8    16.9
6 30 PCT T       19     .020     9.16    257     9.201     9117       20       40       85    .077     1.6         3     6.5      24    13.4
7 90 PCT T       18     .050    13.27    542    13.339    19187       28      195      259    .113     3.2        16    29.2      72     2.5
8 30 PCT T       16     .030     9.09    238     9.137     9117       17       60       79    .077     1.3         5     6.1      24    13.4
9 C.T.           47     .030     9.52     46     9.601     2313       26       30        8    .143     3.6         4     1.1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     1.1         2     3.7
1 IDLE           16     .020     7.84     87     7.877     2177        5       11        8    .232     1.1         3     1.9       0    15.4
2 30 PCT T       21     .030     9.11    230     9.163     9117       23       60       76    .077     1.7         5     5.9      24    13.4
3 60 PCT T       18     .030    11.43    468    11.479    14697       25       78      199    .147     3.7        11    29.2      48     7.2
4 30 PCT T       16     .020     9.08    254     9.117     9117       17       40       84    .077     1.3         3     6.5      24    13.4
5 10 PCT T       16     .020     8.22    133     8.257     6713       14       33       36    .057      .8         2     2.0       8    16.9
6 30 PCT T       18     .020     9.17    260     9.209     9117       19       40       85    .077     1.5         3     6.6      24    13.4
7 90 PCT T       17     .040    13.30    494    13.358    19187       26      116      231    .113     3.0        13    26.1      72     2.5
8 30 PCT T       16     .030     9.09    251     9.137     9117       17       60       83    .077     1.3         5     6.4      24    13.4
9 C.T.           45     .030     9.55     47     9.629     2313       24       30        8    .143     3.5         4     1.1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .8         2     3.7
1 IDLE           16     .020     7.84     87     7.877     2177        5       11        8    .232     1.1         3     1.9       0    15.4
2 30 PCT T       19     .020     9.09    218     9.131     9117       20       40       72    .077     1.6         3     5.6      24    13.4
3 60 PCT T       17     .030    11.47    461    11.518    14697       23       77      195    .147     3.4        11    28.7      48     7.2
4 30 PCT T       16     .030     9.10    253     9.147     9117       17       60       84    .077     1.3         5     6.4      24    13.4
5 10 PCT T       15     .030     8.20    134     8.246     6713       13       49       36    .057      .8         3     2.1       8    16.9
6 30 PCT T       17     .020     9.13    262     9.168     9117       18       40       86    .077     1.4         3     6.7      24    13.4
7 90 PCT T       16     .030    13.17    532    13.217    19187       25       88      256    .113     2.8        10    29.0      72     2.5
8 30 PCT T       14     .020     9.13    264     9.165     9117       15       40       87    .077     1.2         3     6.7      24    13.4
9 C.T.           46     .030     9.52     46     9.600     2313       25       30        8    .143     3.6         4     1.1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .7         2     3.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     1.1         2     3.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------      .8         2     3.8
FOUR CYCLE COMPOSITE =
                                           HC- NDIR 0.35(     1.1) + 0.65(      .8) =      .877   GM/BHP HR
                                           CO- NDIR 0.35(     2.2) + 0.65(     2.0) =     2.094   GM/BHP HR
                                           NO2-NDIR 0.35(     3.7) + 0.65(     3.8) =     3.761   GM/BHP HR
                                                                 CORRECTED NO2 =     4.136   GM/BHP HR
                                                                          BSFC =      .749   LB/BHP HR


------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED      TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR               MAN.
MODE            HC-FID    CO      CO2   NO-CL   CARBON    CONS.       HC       CO      NO2    FACT.  HC-FID       CO   NO2-CL    HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE           63     .020     7.49     50     7.516     2177        2       12        5    .232      .4         3     1.1       0    15.4
2 30 PCT T       27     .020     9.13    190     9.153     9117        3       40       63    .077      .2         3     4.8      24    13.4
3 60 PCT T       34     .030    11.79    400    11.823    14697        4       75      165    .147      .6        11    24.3      48     7.2
4 30 PCT T       48     .030     9.31    260     9.345     9117        5       59       84    .077      .4         5     6.5      24    13.4
5 10 PCT T       29     .020     8.44    110     8.469     6713        2       32       29    .057      .1         2     1.7       8    16.9
6 30 PCT T       26     .020     9.29    250     9.313     9117        3       40       81    .077      .2         3     6.3      24    13.4
7 90 PCT T       22     .060    13.31    520    13.372    19187        3      174      248    .113      .4        20    28.0      72     2.5
8 30 PCT T       13     .020     9.26    250     9.281     9117        1       40       82    .077      .1         3     6.3      24    13.4
9 C.T.          443     .030     9.56      5     9.639     2313       22       30        1    .143     3.2         4      .1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .2         2     3.4
1 IDLE           63     .020     7.49     50     7.516     2177        2       12        5    .232      .4         3     1.1       0    15.4
2 30 PCT T       67     .020     9.14    200     9.167     9117        7       40       66    .077      .5         3     5.1      24    13.4
3 60 PCT T       25     .020    11.62    420    11.643    14697        3       51      176    .147      .5         7    25.9      48     7.2
4 30 PCT T       27     .030     9.15    250     9.183     9117        3       60       82    .077      .2         5     6.3      24    13.4
5 10 PCT T       24     .020     8.25    100     8.272     6713        2       33       27    .057      .1         2     1.5       8    16.9
6 30 PCT T       42     .020     9.16    230     9.184     9117        4       40       76    .077      .3         3     5.8      24    13.4
7 90 PCT T       18     .050    13.27    485    13.322    19187        3      195      232    .113      .3        16    26.2      72     2.5
8 30 PCT T       14     .030     9.09    225     9.121     9117        1       61       75    .077      .1         5     5.7      24    13.4
9 C.T.          391     .030     9.52      4     9.589     2313       20       31        1    .143     2.8         4      .1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .2         2     3.4
1 IDLE           33     .020     7.84     50     7.863     2177        1       11        5    .232      .2         3     1.1       0    15.4
2 30 PCT T       67     .030     9.11    210     9.147     9117        7       60       69    .077      .5         5     5.4      24    13.4
3 60 PCT T       24     .030    11.43    425    11.462    14697        3       78      181    .147      .5        11    26.6      48     7.2
4 30 PCT T       27     .020     9.08    235     9.103     9117        3       40       78    .077      .2         3     6.0      24    13.4
5 10 PCT T       24     .020     8.22     95     8.242     6713        2       33       26    .057      .1         2     1.5       8    16.9
6 30 PCT T       40     .020     9.17    220     9.194     9117        4       40       72    .077      .3         3     5.6      24    13.4
7 90 PCT T       18     .040    13.30    480    13.342    19187        3      116      229    .113      .3        13    25.9      72     2.5
8 30 PCT T       12     .030     9.09    210     9.121     9117        1       61       70    .077      .1         5     5.4      24    13.4
9 C.T.          365     .030     9.55      4     9.616     2313       18       30        1    .143     2.6         4      .1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .2         2     3.4
1 IDLE           33     .020     7.84     50     7.863     2177        1       11        5    .232      .2         3     1.1       0    15.4
2 30 PCT T       62     .020     9.09    190     9.116     9117        6       40       63    .077      .5         3     4.9      24    13.4
3 60 PCT T       24     .030    11.47    430    11.502    14697        3       77      182    .147      .5        11    26.8      48     7.2
4 30 PCT T       27     .030     9.10    230     9.133     9117        3       60       76    .077      .2         5     5.9      24    13.4
5 10 PCT T       23     .030     8.20     95     8.232     6713        2       49       26    .057      .1         3     1.5       8    16.9
6 30 PCT T       40     .020     9.13    220     9.154     9117        4       40       73    .077      .3         3     5.6      24    13.4
7 90 PCT T       18     .030    13.17    450    13.202    19187        3       88      217    .113      .3        10    24.5      72     2.5
8 30 PCT T       14     .020     9.13    230     9.151     9117        1       40       76    .077      .1         3     5.9      24    13.4
9 C.T.          403     .030     9.52      4     9.590     2313       20       31        1    .143     2.9         4      .1       0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------      .2         2     3.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------      .2         2     3.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------      .2         2     3.3
FOUR CYCLE COMPOSITE =
                                           HC- FID  0.35(      .2) + 0.65(      .2) =      .222   GM/BHP HR
                                           CO- NDIR 0.35(     2.2) + 0.65(     2.0) =     2.088   GM/BHP HR
                                           NO2-CL   0.35(     3.4) + 0.65(     3.3) =     3.358   GM/BHP HR
                                                                 CORRECTED NO2 =     3.694   GM/BHP HR
                                                                          BSFC =      .749   LB/BHP HR
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                    TABLE C-39. MASS EMISSIONS BY NINE-MODE EPA
ENGINE-3-1X  TEST-91  RUN-6   EGR-CAT-2-AIR          09-11-73       K =1.109       HUM =129.7  GR/LB
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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE            HC     CO    CO2     NO    CARBON   CONS.      HC      CO    NO2    FACT.   HC        CO    NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE         137   .050   7.19     75    7.388    2177       44      30      7    .232   10.1        7    1.7     0   15.4
2 30 PCT T      43   .050   9.15    170    9.246    9117       46     100     56    .077    3.5        8    4.3    24   13.4
3 60 PCT T      36   .050  11.86    348   11.949   14697       48     124    142    .147    7.0       18   20.9    48    7.2
4 30 PCT T      36   .040   9.20    221    9.274    9117       38      79     72    .077    2.9        6    5.6    24   13.4
5 10 PCT T      37   .040   8.29    121    8.320    6713       32      65     32    .057    1.8        4    1.8     8   16.9
6 30 PCT T      38   .050   9.27    234    9.361    9117       40      98     76    .077    3.1        8    5.8    24   13.4
7 90 PCT T      37   .080  13.32    485   13.440   19187       57     231    230    .113    6.4       26   26.0    72    2.5
8 30 PCT T      35   .050   9.26    230    9.348    9117       37      99     74    .077    2.8        8    5.7    24   13.4
9 C.T.          79   .050   4.62     55    4.750    2313       39      49      9    .143    5.6        7    1.3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.9        4    3.2
1 IDLE         137   .050   7.19     75    7.388    2177       44      30      7    .232   10.1        7    1.7     0   15.4
2 30 PCT T      40   .060   9.32    216    9.423    9117       42     117     69    .077    3.2        9    5.3    24   13.4
3 60 PCT T      38   .050  11.64    367   11.731   14697       51     127    153    .147    7.6       19   22.4    48    7.2
4 30 PCT T      38   .050   9.41    252    9.501    9117       39      97     80    .077    3.0        7    6.2    24   13.4
5 10 PCT T      38   .050   8.53    141    8.621    6713       32      79     36    .057    1.8        4    2.1     8   16.9
6 30 PCT T      39   .050   9.32    222    9.412    9117       41      98     71    .077    3.1        8    5.5    24   13.4
7 90 PCT T      39   .070  13.38    378   13.492   19187       60     201    178    .113    6.8       23   20.2    72    2.5
8 30 PCT T      38   .040   9.31    238    9.391    9117       40      78     77    .077    3.1        6    5.9    24   13.4
9 C.T.          65   .050   4.60     52    4.720    2313       34      48      8    .143    4.9        7    1.2     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.9        4    3.1
1 IDLE          39   .040   7.83     85    7.912    2177       12      22      9    .232    2.7        5    2.0     0   15.4
2 30 PCT T      41   .050   9.21    201    9.304    9117       43      88     65    .077    3.3        8    5.0    24   13.4
3 60 PCT T      39   .040  11.54    408   11.622   14697       53     102    171    .147    7.8       15   25.2    48    7.2
4 30 PCT T      38   .030   9.22    255    9.291    9117       40      59     83    .077    3.1        5    6.4    24   13.4
5 10 PCT T      39   .040   8.46    147    8.542    6713       33      63     38    .057    1.9        4    2.2     8   16.9
6 30 PCT T      40   .040   9.20    245    9.283    9117       42      79     80    .077    3.3        6    6.2    24   13.4
7 90 PCT T      40   .060  13.39    437   13.493   19187       61     172    206    .113    6.9       19   23.3    72    2.5
8 30 PCT T      38   .040   9.25    263    9.331    9117       40      79     85    .077    3.1        6    6.6    24   13.4
9 C.T.          66   .050   4.60     53    4.721    2313       35      49      9    .143    5.0        7    1.2     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.6        3    3.4
1 IDLE          39   .040   7.83     85    7.912    2177       12      22      9    .232    2.7        5    2.0     0   15.4
2 30 PCT T      42   .050   9.23    224    9.325    9117       44      94     73    .077    3.4        8    5.6    24   13.4
3 60 PCT T      40   .040  11.59    395   11.673   14697       54     102    165    .147    8.0       15   24.3    48    7.2
4 30 PCT T      40   .030   9.11    233    9.183    9117       43      60     77    .077    3.3        5    5.9    24   13.4
5 10 PCT T      39   .050   8.32    130    8.412    6713       34      81     34    .057    1.9        5    2.0     8   16.9
6 30 PCT T      41   .040   9.20    239    9.284    9117       43      79     78    .077    3.3        6    6.0    24   13.4
7 90 PCT T      41   .060  13.28    456   13.384   19187       63     174    217    .113    7.2       20   24.5    72    2.5
8 30 PCT T      38   .040   9.22    258    9.301    9117       40      79     84    .077    3.1        6    6.5    24   13.4
9 C.T.          67   .050   4.55     56    4.672    2313       36      50      9    .143    5.1        7    1.3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.7        3    3.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     1.9        4    3.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     1.6        3    3.4
FOUR CYCLE COMPOSITE -                HC- NDIR 0.35(    1.9) + 0.65(    1.6) =    1.722   GM/BHP HR
                                      CO- NDIR 0.35(    3.9) + 0.65(    3.3) =    3.498   GM/BHP HR
                                      NO2-NDIR 0.35(    3.1) + 0.65(    3.4) =    3.293   GM/BHP HR
                                                           CORRECTED NO2 =    3.652   GM/BHP HR
                                                                    BSFC =     .799   LB/BHP HR


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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE          HC-FID   CO    CO2  NO-CL    CARBON   CONS.      HC      CO    NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE          52   .050   7.19     38    7.245    2177        2      30      4    .232     .4        7     .9     0   15.4
2 30 PCT T     127   .050   9.15    130    9.213    9117       13     100     43    .077    1.0        8    3.3    24   13.4
3 60 PCT T      32   .050  11.86    300   11.913   14697        4     125    123    .147     .6       18   18.1    48    7.2
4 30 PCT T      42   .040   9.20    170    9.244    9117        4      80     56    .077     .3        6    4.3    24   13.4
5 10 PCT T      37   .040   8.24     70    8.284    6713        3      65     19    .057     .2        4    1.1     8   16.9
6 30 PCT T      55   .050   9.27    190    9.326    9117        5      99     62    .077     .4        8    4.7    24   13.4
7 90 PCT T      28   .080  13.32    435   13.403   19187        4     231    207    .113     .5       26   23.4    72    2.5
8 30 PCT T      21   .050   9.26    180    9.312    9117        2      99     59    .077     .2        8    4.5    24   13.4
9 C.T.         457   .050   4.62      4    4.716    2313       22      50      1    .143    3.2        7     .1     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .3        4    2.6
1 IDLE          52   .050   7.19     38    7.245    2177        3      30      4    .232     .4        7     .9     0   15.4
2 30 PCT T      73   .060   9.32    175    9.387    9117        7     118     56    .077     .5        9    4.3    24   13.4
3 60 PCT T      33   .050  11.64    310   11.693   14697        4     127    129    .147     .6       19   19.0    48    7.2
4 30 PCT T      34   .050   9.41    205    9.463    9117        3      97     66    .077     .3        7    5.0    24   13.4
5 10 PCT T      29   .050   8.53     85    8.583    6713        2      79     22    .057     .1        5    1.3     8   16.9
6 30 PCT T      46   .050   9.32    180    9.375    9117        4      98     58    .077     .3        8    4.5    24   13.4
7 90 PCT T      22   .070  13.38    330   13.452   19187        3     202    156    .113     .4       23   17.7    72    2.5
8 30 PCT T      29   .040   9.31    190    9.353    9117        3      79     61    .077     .2        6    4.7    24   13.4
9 C.T.         379   .050   4.60      3    4.688    2313       19      50      0    .143    2.7        7     .1     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .2        4    2.5
1 IDLE          59   .040   7.83     51    7.875    2177        1      22      5    .232     .3        5    1.1     0   15.4
2 30 PCT T      69   .050   9.21    160    9.267    9117        7      94     52    .077     .5        8    4.0    24   13.4
3 60 PCT T      31   .040  11.54    350   11.583   14697        4     103    147    .147     .6       15   21.7    48    7.2
4 30 PCT T      33   .030   9.22    210    9.253    9117        3      60     69    .077     .2        5    5.3    24   13.4
5 10 PCT T      30   .040   8.46     90    8.503    6713        2      64     24    .057     .1        4    1.3     8   16.9
6 30 PCT T      46   .040   9.20    200    9.245    9117        4      80     65    .077     .3        6    5.0    24   13.4
7 90 PCT T      25   .060  13.39    380   13.452   19187        4     173    180    .113     .4       20   20.3    72    2.5
8 30 PCT T      18   .040   9.25    215    9.292    9117        2      79     70    .077     .1        6    5.4    24   13.4
9 C.T.         391   .050   4.60      4    4.689    2313       19      50      1    .143    2.8        7     .1     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .2        3    2.8
1 IDLE          54   .040   7.83     51    7.875    2177        1      22      5    .232     .3        5    1.1     0   15.4
2 30 PCT T      72   .050   9.23    175    9.287    9117        7      94     57    .077     .5        8    4.4    24   13.4
3 60 PCT T      33   .040  11.59    340   11.633   14697        4     102    143    .147     .6       15   21.0    48    7.2
4 30 PCT T      34   .030   9.11    185    9.193    9117        3      60     61    .077     .3        5    4.7    24   13.4
5 10 PCT T      30   .050   8.32     85    8.373    6713        2      81     23    .057     .1        5    1.3     8   16.9
6 30 PCT T      48   .040   9.20    190    9.245    9117        5      80     62    .077     .4        6    4.8    24   13.4
7 90 PCT T      26   .060  13.28    385   13.343   19187        4     174    184    .113     .4       20   20.8    72    2.5
8 30 PCT T      69   .040   9.22    205    9.267    9117        7      79     67    .077     .5        6    5.2    24   13.4
9 C.T.         431   .050   4.55      4    4.643   /2313       21      50      1    .143    3.1        7     .1     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .3        3    2.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------      .3        4    2.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------      .3        3    2.8
FOUR CYCLE COMPOSITE -                HC- FID  0.35(     .3) + 0.65(     .3) =     .258   GM/BHP HR
                                      CO- NDIR 0.35(    3.9) + 0.65(    3.3) =    3.514   GM/BHP HR
                                      NO2-CL   0.35(    2.6) + 0.65(    2.8) =    2.694   GM/BHP HR
                                                           CORRECTED NO2 =    2.987   GM/BHP HR
                                                                    BSFC =     .799   LB/BHP HR
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TABLE C-40. MASS EMISSIONS BY NINE-MODE EPA

ENGINE 3-1X TEST 91 RUN 7 EGR-CAT-2-AIR 09-11-73 K =1.100 HUM =120.9 GR/LB

	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
MODE	HC	CO	CO2	NO	CARBON	CONS.	HC	CO	NO2	FACT.	HC	CO	NO2	HP	VAC.
1 IDLE	65	.040	7.39	79	7.500	2177	20	23	7	.232	4.7	5	1.7	0	15.9
2 30 PCT T	25	.040	9.17	238	9.237	9117	27	80	78	.077	2.1	6	6.0	24	13.9
3 60 PCT T	20	.040	11.56	471	11.622	14697	27	102	198	.147	4.0	15	29.1	48	7.2
4 30 PCT T	19	.030	9.18	267	9.231	9117	20	60	88	.077	1.6	5	6.7	24	13.9
5 10 PCT T	18	.040	8.22	127	8.279	6713	16	66	34	.057	.9	4	1.9	8	16.9
6 30 PCT T	20	.040	9.09	222	9.152	9117	22	80	74	.077	1.7	6	5.7	24	13.9
7 90 PCT T	19	.070	13.30	477	13.391	19187	29	203	227	.113	3.3	23	25.6	72	2.5
8 30 PCT T	17	.040	9.23	265	9.288	9117	18	79	86	.077	1.4	6	6.6	24	13.9
9 C.T.	59	.050	4.56	41	4.668	2313	29	50	7	.143	4.1	7	1.0	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											1.0	3	3.7		
1 IDLE	65	.040	7.39	79	7.500	2177	20	23	7	.232	4.7	5	1.7	0	15.9
2 30 PCT T	23	.030	9.24	246	9.295	9117	24	59	80	.077	1.9	5	6.2	24	13.9
3 60 PCT T	20	.030	11.55	450	11.602	14697	27	77	189	.147	4.0	11	27.8	48	7.2
4 30 PCT T	20	.040	9.26	297	9.322	9117	21	79	96	.077	1.6	6	7.4	24	13.9
5 10 PCT T	19	.030	8.27	131	8.321	6713	17	49	35	.057	.9	3	2.0	8	16.9
6 30 PCT T	22	.030	9.29	287	9.344	9117	23	59	93	.077	1.8	5	7.2	24	13.9
7 90 PCT T	21	.060	13.32	504	13.403	19187	32	179	240	.113	3.7	20	27.1	72	2.5
8 30 PCT T	20	.030	9.31	308	9.362	9117	21	59	100	.077	1.6	5	7.7	24	13.9
9 C.T.	55	.050	4.58	45	4.689	2313	29	50	7	.143	4.2	7	1.1	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											1.1	3	3.8		
1 IDLE	22	.030	7.78	78	7.834	2177	7	17	7	.232	1.5	4	1.7	0	15.9
2 30 PCT T	24	.030	9.21	250	9.266	9117	26	60	82	.077	2.0	5	6.3	24	13.9
3 60 PCT T	23	.030	11.76	445	11.815	14697	31	75	184	.147	4.5	11	27.0	48	7.2
4 30 PCT T	21	.040	9.18	258	9.243	9117	22	80	84	.077	1.7	6	6.5	24	13.9
5 10 PCT T	20	.030	8.28	123	8.332	6713	17	49	33	.057	1.0	3	1.9	8	16.9
6 30 PCT T	23	.030	9.30	272	9.355	9117	24	59	88	.077	1.9	5	6.8	24	13.9
7 90 PCT T	22	.060	13.37	453	13.454	19187	34	173	214	.113	3.8	20	24.2	72	2.5
8 30 PCT T	20	.030	9.31	281	9.362	9117	21	59	91	.077	1.6	5	7.0	24	13.9
9 C.T.	48	.040	4.57	33	4.662	2313	26	40	5	.143	3.7	6	.8	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											.9	3	3.6		
1 IDLE	22	.030	7.78	78	7.834	2177	7	17	7	.232	1.5	4	1.7	0	15.9
2 30 PCT T	25	.030	9.24	230	9.297	9117	26	59	75	.077	2.0	5	5.8	24	13.9
3 60 PCT T	23	.030	11.66	447	11.719	14697	31	76	186	.147	4.6	11	27.4	48	7.2
4 30 PCT T	22	.030	9.27	286	9.324	9117	23	59	93	.077	1.8	5	7.1	24	13.9
5 10 PCT T	22	.030	8.35	142	8.404	6713	19	48	38	.057	1.1	3	2.1	8	16.9
6 30 PCT T	25	.020	9.31	298	9.357	9117	26	39	96	.077	2.0	3	7.4	24	13.9
7 90 PCT T	23	.060	13.43	503	13.515	19187	35	172	237	.113	4.0	19	26.8	72	2.5
8 30 PCT T	23	.030	9.30	305	9.355	9117	24	59	99	.077	1.9	5	7.6	24	13.9
9 C.T.	50	.040	4.55	47	4.644	2313	27	40	8	.143	3.8	6	1.1	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											1.0	3	3.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---											1.0	3	3.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---											1.0	3	3.7		

FOUR CYCLE COMPOSITE =
HC- NDIR 0.35(1.0) + 0.65(1.0) = .994 GM/BHP HR
CO- NDIR 0.35(3.1) + 0.65(2.7) = 2.818 GM/BHP HR
NO2-NDIR 0.35(3.7) + 0.65(3.7) = 3.695 GM/BHP HR
CORRECTED NO2 = 4.066 GM/BHP HR
BSFC = .799 LB/BHP HR

	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
MODE	HC-FID	CO	CO2	NO-CL	CARBON	CONS.	HC	CO	NO2	FACT.	HC-FID	CO	NO2-CL	HP	VAC.
1 IDLE	80	.040	7.39	55	7.438	2177	2	24	5	.232	.5	5	1.2	0	15.9
2 30 PCT T	99	.040	9.17	215	9.220	9117	10	80	71	.077	.8	6	5.4	24	13.9
3 60 PCT T	38	.040	11.56	425	11.604	14697	5	102	179	.147	.7	15	26.3	48	7.2
4 30 PCT T	30	.030	9.18	235	9.213	9117	3	60	77	.077	.2	5	5.9	24	13.9
5 10 PCT T	33	.040	8.22	85	8.263	6713	3	66	23	.057	.2	4	1.3	8	16.9
6 30 PCT T	54	.040	9.09	195	9.135	9117	5	81	65	.077	.4	6	5.0	24	13.9
7 90 PCT T	21	.070	13.30	425	13.372	19187	3	203	202	.113	.3	23	22.9	72	2.5
8 30 PCT T	14	.040	9.23	230	9.271	9117	1	79	75	.077	.1	6	5.8	24	13.9
9 C.T.	417	.050	4.56	10	4.652	2313	21	50	2	.143	3.0	7	.2	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											.3	3	3.2		
1 IDLE	80	.040	7.39	55	7.438	2177	2	24	5	.232	.5	5	1.2	0	15.9
2 30 PCT T	64	.030	9.24	215	9.276	9117	6	60	70	.077	.5	5	5.4	24	13.9
3 60 PCT T	22	.030	11.55	415	11.582	14697	3	77	175	.147	.4	11	25.7	48	7.2
4 30 PCT T	24	.040	9.26	260	9.302	9117	2	79	85	.077	.2	6	6.5	24	13.9
5 10 PCT T	18	.030	8.27	85	8.302	6713	1	49	26	.057	.1	3	1.5	8	16.9
6 30 PCT T	45	.030	9.29	250	9.324	9117	4	59	81	.077	.3	5	6.2	24	13.9
7 90 PCT T	15	.060	13.32	480	13.381	19187	2	179	228	.113	.2	20	25.8	72	2.5
8 30 PCT T	10	.030	9.31	265	9.341	9117	1	59	86	.077	.1	5	6.6	24	13.9
9 C.T.	431	.050	4.58	10	4.673	2313	21	50	2	.143	3.0	7	.2	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											.2	3	3.4		
1 IDLE	36	.030	7.78	60	7.814	2177	1	17	6	.232	.2	4	1.3	0	15.9
2 30 PCT T	58	.030	9.21	215	9.246	9117	6	60	70	.077	.4	5	5.4	24	13.9
3 60 PCT T	21	.030	11.76	395	11.792	14697	3	76	163	.147	.4	11	24.0	48	7.2
4 30 PCT T	24	.040	9.18	253	9.222	9117	2	80	83	.077	.2	6	6.4	24	13.9
5 10 PCT T	18	.030	8.28	100	8.312	6713	1	49	27	.057	.1	3	1.5	8	16.9
6 30 PCT T	37	.030	9.30	260	9.334	9117	4	59	84	.077	.3	5	6.5	24	13.9
7 90 PCT T	13	.060	13.37	475	13.431	19187	2	173	225	.113	.2	20	25.5	72	2.5
8 30 PCT T	9	.030	9.31	255	9.341	9117	1	59	83	.077	.1	5	6.4	24	13.9
9 C.T.	391	.040	4.57	10	4.649	2313	19	40	2	.143	2.8	6	.2	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											.2	3	3.4		
1 IDLE	36	.030	7.78	60	7.814	2177	1	17	6	.232	.2	4	1.3	0	15.9
2 30 PCT T	55	.030	9.24	215	9.276	9117	5	60	70	.077	.4	5	5.4	24	13.9
3 60 PCT T	19	.030	11.66	410	11.692	14697	2	76	171	.147	.3	11	25.2	48	7.2
4 30 PCT T	17	.030	9.27	260	9.302	9117	2	59	85	.077	.1	5	6.5	24	13.9
5 10 PCT T	36	.030	8.35	105	8.384	6713	3	49	28	.057	.2	3	1.6	8	16.9
6 30 PCT T	40	.020	9.31	275	9.334	9117	4	39	89	.077	.3	3	6.9	24	13.9
7 90 PCT T	12	.060	13.43	470	13.491	19187	2	172	222	.113	.2	19	25.1	72	2.5
8 30 PCT T	7	.030	9.30	270	9.331	9117	1	59	88	.077	.0	5	6.7	24	13.9
9 C.T.	391	.040	4.55	10	4.629	2313	20	40	2	.143	2.9	6	.2	0	23.9
---------------CYCLE COMPOSITE IN GM/BHP HR---											.2	3	3.4		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---											.3	3	3.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---											.2	3	3.4		

FOUR CYCLE COMPOSITE =
HC- FID 0.35(.3) + 0.65(.2) = .220 GM/BHP HR
CO- NDIR 0.35(3.1) + 0.65(2.7) = 2.834 GM/BHP HR
NO2-CL 0.35(3.3) + 0.65(3.4) = 3.366 GM/BHP HR
CORRECTED NO2 = 3.703 GM/BHP HR
BSFC = .799 LB/BHP HR

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                   TABLE C-41. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-2   TEST 84  RUN 1  EMISSION CONT. SYSTEM  08-30-79       K =1.101      HUM =121.6  GR/LB
-------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR             MAN.
MODE         HC      CO    CO2     NO    CARBON   CONS.     HC     CO     NO2    FACT.   HC      CO    NO2    HP     VAC.
-------------------------------------------------------------------------------------------------------
1 IDLE       67   2.030   8.72     83   10.822    3402      23   1289      9    .232    5.3    299    2.0     0    10.9
2 30 PCT T   25    .850  10.67     71   11.547    9979      23   1484     20    .077    1.8    114    1.6    25    14.3
3 60 PCT T   23    .100  12.90     70   13.025   15286      29    237     27    .147    4.3     35    4.0    49     8.5
4 30 PCT T   23    .240  11.34     67   11.605    9979      21    417     19    .077    1.6     32    1.5    25    14.3
5 10 PCT T   23    .300  10.38     65   10.705    7122      17    403     14    .057     .9     23     .8     8    18.0
6 30 PCT T   23    .180  11.88     66   12.085    9979      21    300     18    .077    1.6     23    1.4    25    14.3
7 90 PCT T   23    .170  14.11    110   14.305   20593      36    494     53    .113    4.0     56    5.9    74     2.9
8 30 PCT T   22    .110  11.80     63   11.934    9979      20    186     17    .077    1.5     14    1.3    25    14.3
9 C.T.       24    .070   7.12     55    7.216    3538      13     69      9    .143    1.8     10    1.3     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------    1.0     26     .8
1 IDLE       67   2.030   8.72     83   10.822    3402      23   1289      9    .232    5.3    299    2.0     0    10.9
2 30 PCT T   23    .170  11.81     61   12.005    9979      21    285     17    .077    1.6     22    1.3    25    14.3
3 60 PCT T   23    .060  13.07     67   13.155   15286      29    141     26    .147    4.2     21    3.8    49     8.5
4 30 PCT T   22    .120  11.54     63   11.684    9979      20    207     18    .077    1.6     16    1.4    25    14.3
5 10 PCT T   22    .150  10.94     62   11.114    7122      15    194     13    .057     .9     11     .8     8    18.0
6 30 PCT T   22    .120  11.79     61   11.934    9979      20    203     17    .077    1.5     16    1.3    25    14.3
7 90 PCT T   25    .140  14.05    101   14.217   20593      39    410     49    .113    4.4     46    5.5    74     2.9
8 30 PCT T   24    .080  11.79     62   11.896    9979      22    136     17    .077    1.7     10    1.3    25    14.3
9 C.T.       23    .060   7.11     53    7.195    3538      12     60      9    .143    1.7      9    1.2     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------    1.0     19     .8
1 IDLE       23    .030  11.10     48   11.155    3402       8     18      5    .232    1.8      4    1.1     0    10.9
2 30 PCT T   24    .160  11.70     62   11.886    9979      22    271     17    .077    1.7     21    1.3    25    14.3
3 60 PCT T   24    .060  13.43     68   13.516   15286      29    137     26    .147    4.3     20    3.8    49     8.5
4 30 PCT T   24    .080  11.84     61   11.946    9979      22    135     17    .077    1.7     10    1.3    25    14.3
5 10 PCT T   24    .130  10.84     62   10.996    7122      17    170     13    .057    1.0     10     .8     8    18.0
6 30 PCT T   24    .120  12.03     61   12.176    9979      21    199     17    .077    1.6     15    1.3    25    14.3
7 90 PCT T   25    .190  14.32    107   14.537   20593      38    544     50    .113    4.3     61    5.7    74     2.9
8 30 PCT T   24    .050  12.00     59   12.076    9979      21     83     16    .077    1.6      6    1.2    25    14.3
9 C.T.       23    .060   7.18     53    7.265    3538      12     59      9    .143    1.7      8    1.2     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .8      7     .7
1 IDLE       23    .030  11.10     48   11.155    3402       8     18      5    .232    1.8      4    1.1     0    10.9
2 30 PCT T   24    .140  11.63     60   11.796    9979      22    234     17    .077    1.7     18    1.3    25    14.3
3 60 PCT T   25    .050  13.30     68   13.377   15286      31    115     26    .147    4.5     17    3.8    49     8.5
4 30 PCT T   24    .040  11.79     60   11.856    9979      22    153     17    .077    1.7     12    1.3    25    14.3
5 10 PCT T   23    .150  10.65     60   10.825    7122      16    194     13    .057     .9     11     .7     8    18.0
6 30 PCT T   24    .110  11.96     60   12.096    9979      21    183     16    .077    1.6     14    1.3    25    14.3
7 90 PCT T   26    .200  14.35    110   14.578   20593      40    571     52    .113    4.5     64    5.8    74     2.9
8 30 PCT T   25    .050  11.90     60   11.977    9979      22     84     17    .077    1.7      6    1.3    25    14.3
9 C.T.       25    .070   7.25     53    7.347    3538      13     68      8    .143    1.9     10    1.2     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .9      7     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------    1.0     22     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------     .8      7     .8
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     1.0) + 0.65(     .8) =      .889   GM/BHP HR
                                         CO- NDIR 0.35(    22.3) + 0.65(    6.7) =    12.136   GM/BHP HR
                                         NO2-NDIR 0.35(      .8) + 0.65(     .8) =      .773   GM/BHP HR
                                                              CORRECTED NO2 =      .851   GM/BHP HR
                                                                       BSFC =      .871   LB/BHP HR


-------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE        HC-FID   CO    CO2   NO-CL   CARBON   CONS.     HC     CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP     VAC.
-------------------------------------------------------------------------------------------------------
1 IDLE     1274   2.030   8.72      1   10.878    3402      40   1282      0    .232    9.3    298     .0     0    10.9
2 30 PCT T   14    .850  10.67      8   11.522    9979       2   1487      2    .077     .1    115     .2    25    14.3
3 60 PCT T    8    .100  12.90     32   13.001   15286       1    238     12    .147     .1     35    1.8    49     8.5
4 30 PCT T    7    .240  11.34     11   11.581    9979       1    418      3    .077     .0     32     .2    25    14.3
5 10 PCT T    7    .300  10.38      3   10.681    7122       0    404      1    .057     .0     23     .0     8    18.0
6 30 PCT T    7    .180  11.88      4   12.061    9979       1    301      2    .077     .0     23     .2    25    14.3
7 90 PCT T    7    .170  14.11     71   14.281   20593       1    495     34    .113     .1     56    3.8    74     2.9
8 30 PCT T    3    .110  11.80     11   11.910    9979       0    186      3    .077     .0     14     .2    25    14.3
9 C.T.       66    .070   7.12      6    7.197    3538       3     70      1    .143     .5     10     .1     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .4     26     .3
1 IDLE     1274   2.030   8.72      1   10.878    3402      40   1282      0    .232    9.3    298     .0     0    10.9
2 30 PCT T    4    .170  11.81     10   11.980    9979       0    286      3    .077     .0     22     .2    25    14.3
3 60 PCT T    3    .060  13.07     28   13.130   15286       0    141     11    .147     .1     21    1.6    49     8.5
4 30 PCT T    3    .120  11.54     10   11.660    9979       0    207      3    .077     .0     16     .2    25    14.3
5 10 PCT T    3    .150  10.94      3   11.090    7122       0    195      1    .057     .0     11     .0     8    18.0
6 30 PCT T    7    .120  11.79      4   11.911    9979       1    203      3    .077     .0     16     .2    25    14.3
7 90 PCT T    6    .140  14.05     65   14.191   20593       1    410     31    .113     .1     46    3.5    74     2.9
8 30 PCT T    2    .080  11.79     10   11.870    9979       0    136      3    .077     .0     10     .2    25    14.3
9 C.T.       60    .060   7.11      8    7.176    3538       3     60      1    .143     .4      9     .2     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .4     19     .3
1 IDLE        3    .030  11.10      1   11.130    3402       0     19      0    .232     .0      4     .0     0    10.9
2 30 PCT T    3    .160  11.70      4   11.860    9979       0    272      3    .077     .0     21     .2    25    14.3
3 60 PCT T    2    .060  13.43     24   13.490   15286       0    137     11    .147     .0     20    1.6    49     8.5
4 30 PCT T    2    .080  11.84     11   11.920    9979       0    135      3    .077     .0     10     .2    25    14.3
5 10 PCT T    2    .130  10.84      4   10.970    7122       0    170      1    .057     .0     10     .0     8    18.0
6 30 PCT T    3    .120  12.03      4   12.150    9979       0    199      2    .077     .0     15     .2    25    14.3
7 90 PCT T    6    .190  14.32     64   14.511   20593       1    545     30    .113     .1     62    3.4    74     2.9
8 30 PCT T    3    .050  12.00     12   12.050    9979       0     84      3    .077     .0      6     .3    25    14.3
9 C.T.       50    .060   7.18      6    7.245    3538       2     59      1    .143     .4      8     .1     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .0      7     .3
1 IDLE        3    .030  11.10      1   11.130    3402       0     19      0    .232     .0      4     .0     0    10.9
2 30 PCT T    3    .140  11.63      4   11.770    9979       0    240      3    .077     .0     18     .2    25    14.3
3 60 PCT T    3    .050  13.30     28   13.350   15286       0    116     11    .147     .1     17    1.6    49     8.5
4 30 PCT T    3    .040  11.79      4   11.830    9979       0    153      3    .077     .0     12     .2    25    14.3
5 10 PCT T    2    .150  10.65      3   10.800    7122       0    200      1    .057     .0     11     .0     8    18.0
6 30 PCT T    7    .110  11.96      4   12.071    9979       1    184      2    .077     .0     14     .2    25    14.3
7 90 PCT T    7    .200  14.35     64   14.551   20593       1    572     30    .113     .1     65    3.4    74     2.9
8 30 PCT T    3    .050  11.90     11   11.950    9979       0     84      3    .077     .0      6     .2    25    14.3
9 C.T.       68    .070   7.25      6    7.327    3538       3     68      1    .143     .5     10     .1     0    22.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------     .0      7     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------     .4     22     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------     .0      7     .3
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(      .4) + 0.65(     .0) =      .168   GM/BHP HR
                                         CO- NDIR 0.35(    22.3) + 0.65(    6.7) =    12.129   GM/BHP HR
                                         NO2-CL   0.35(      .3) + 0.65(     .3) =      .262   GM/BHP HR
                                                              CORRECTED NO2 =      .288   GM/BHP HR
                                                                       BSFC =      .871   LB/BHP HR
```

TABLE C-42. MASS EMISSIONS BY NINE-MODE EPA

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ENGINE 3-2   TEST-84  RUN-2  EMISSION CONT. SYSTEM  08-30-73      K =1.105     HUM =125.5  GR/LB
--------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2      NO   CARBON   CONS.      HC      CO     NO2    FACT.    HC        CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE        33    .720   10.80      69   11.556    3402      10     428       7    .232    2.4       99    1.6     0    10.9
2 30 PCT T    19    .690   11.01      68   11.721    9979      17    1187      19    .077    1.3       91    1.5    25    14.3
3 60 PCT T    18    .090   13.40      74   13.509   15286      22     206      28    .147    3.2       30    4.1    49     8.5
4 30 PCT T    18    .200   11.87      69   12.089    9979      16     333      18    .077    1.2       26    1.4    25    14.3
5 10 PCT T    18    .320   10.53      65   10.869    7122      13     424      14    .057     .7       24     .8     8    18.0
6 30 PCT T    19    .180   12.09      63   12.291    9979      17     295      17    .077    1.3       23    1.3    25    14.3
7 90 PCT T    20    .240   14.58     118   14.842   20593      30     673      54    .113    3.4       76    6.1    74     2.9
8 30 PCT T    19    .100   12.11      64   12.231    9979      17     165      17    .077    1.3       13    1.3    25    14.3
9 C.T.        20    .090    7.22      59    7.332    3538      10      88       9    .143    1.5       13    1.2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .7       17     .8
1 IDLE        33    .720   10.80      69   11.556    3402      10     428       7    .232    2.4       99    1.6     0    10.9
2 30 PCT T    19    .190   11.85      62   12.061    9979      17     318      17    .077    1.3       24    1.3    25    14.3
3 60 PCT T    19    .070   13.58      71   13.671   15286      23     158      26    .147    3.4       23    3.9    49     8.5
4 30 PCT T    18    .110   11.96      61   12.089    9979      16     183      17    .077    1.2       14    1.3    25    14.3
5 10 PCT T    18    .190   10.88      61   11.089    7122      12     246      13    .057     .7       14     .7     8    18.0
6 30 PCT T    18    .120   12.03      62   12.169    9979      16     199      17    .077    1.2       15    1.3    25    14.3
7 90 PCT T    21    .250   14.61     113   14.883   20593      31     699      52    .113    3.5       79    5.9    74     2.9
8 30 PCT T    20    .090   12.07      62   12.182    9979      18     144      17    .077    1.4       11    1.3    25    14.3
9 C.T.        20    .090    7.33      59    7.442    3538      10      86       9    .143    1.5       12    1.2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .7       12     .8
1 IDLE        20    .050   11.61      46   11.682    3402       6      29       4    .232    1.5        7    1.0     0    10.9
2 30 PCT T    20    .180   11.83      62   12.032    9979      18     302      17    .077    1.4       23    1.3    25    14.3
3 60 PCT T    20    .060   13.64      71   13.722   15286      24     135      26    .147    3.5       20    3.9    49     8.5
4 30 PCT T    20    .090   12.03      57   12.142    9979      18     149      16    .077    1.4       12    1.2    25    14.3
5 10 PCT T    20    .150   11.15      62   11.322    7122      14     191      13    .057     .8       11     .7     8    18.0
6 30 PCT T    20    .110   12.06      57   12.192    9979      18     182      15    .077    1.4       14    1.2    25    14.3
7 90 PCT T    21    .220   14.65     116   14.893   20593      31     614      53    .113    3.5       69    6.0    74     2.9
8 30 PCT T    19    .080   12.29      59   12.391    9979      17     131      16    .077    1.3       10    1.2    25    14.3
9 C.T.        19    .080    7.30      53    7.401    3538      10      77       8    .143    1.4       11    1.2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .7        7     .8
1 IDLE        20    .050   11.61      46   11.682    3402       6      29       4    .232    1.5        7    1.0     0    10.9
2 30 PCT T    20    .130   12.01      51   12.162    9979      18     215      14    .077    1.4       17    1.1    25    14.3
3 60 PCT T    20    .070   13.54      64   13.632   15286      24     159      24    .147    3.6       23    3.5    49     8.5
4 30 PCT T    20    .120   11.85      54   11.992    9979      18     202      15    .077    1.4       16    1.1    25    14.3
5 10 PCT T    20    .160   10.91      56   11.092    7122      14     208      12    .057     .8       12     .7     8    18.0
6 30 PCT T    19    .120   12.17      54   12.311    9979      17     196      15    .077    1.3       15    1.1    25    14.3
7 90 PCT T    22    .210   14.59     107   14.824   20593      33     589      49    .113    3.7       67    5.6    74     2.9
8 30 PCT T    20    .060   12.17      55   12.252    9979      18      99      15    .077    1.4        8    1.1    25    14.3
9 C.T.        20    .080    7.27      50    7.372    3538      10      78       8    .143    1.5       11    1.1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .7        7     .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------   .7       15     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------   .7        7     .7
FOUR CYCLE COMPOSITE -
                                          HC- NDIR 0.35(      .7) + 0.65(      .7) =     .691    GM/BHP HR
                                          CO- NDIR 0.35(    14.5) + 0.65(     7.4) =    9.917    GM/BHP HR
                                          NO2-NDIR 0.35(      .8) + 0.65(      .7) =     .749    GM/BHP HR
                                                                  CORRECTED NO2 =     .828    GM/BHP HR
                                                                           BSFC =     .871    LB/BHP HR


--------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE       187    .720   10.80      31   11.539    3402       6     429       3    .232    1.3       99     .7     0    10.9
2 30 PCT T    34    .690   11.01      11   11.703    9979       3    1188       3    .077     .2       92     .2    25    14.3
3 60 PCT T     3    .090   13.40      34   13.490   15286       0     206      13    .147     .1       30    1.9    49     8.5
4 30 PCT T     3    .200   11.87      13   12.070    9979       0     334       4    .077     .0       26     .3    25    14.3
5 10 PCT T     4    .320   10.53       3   10.850    7122       0     424       1    .057     .0       24     .0     8    18.0
6 30 PCT T     7    .180   12.09      11   12.271    9979       1     296       3    .077     .0       23     .2    25    14.3
7 90 PCT T     7    .240   14.58      73   14.821   20593       1     674      34    .113     .1       76    3.8    74     2.9
8 30 PCT T     4    .100   12.11      12   12.210    9979       0     165       3    .077     .0       13     .3    25    14.3
9 C.T.        57    .090    7.22       7    7.316    3538       3      88       1    .143     .4       13     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .1       17     .3
1 IDLE       187    .720   10.80      31   11.539    3402       6     429       3    .232    1.3       99     .7     0    10.9
2 30 PCT T     6    .190   11.85      10   12.041    9979       0     318       3    .077     .0       24     .2    25    14.3
3 60 PCT T     6    .070   13.58      29   13.651   15286       1     158      11    .147     .1       23    1.6    49     8.5
4 30 PCT T     6    .110   11.96      10   12.071    9979       0     184       3    .077     .0       14     .2    25    14.3
5 10 PCT T     6    .190   10.88       3   11.071    7122       0     247       1    .057     .0       14     .0     8    18.0
6 30 PCT T     7    .120   12.03       9   12.151    9979       1     199       2    .077     .0       15     .2    25    14.3
7 90 PCT T     7    .250   14.61      66   14.861   20593       1     700      30    .113     .1       79    3.4    74     2.9
8 30 PCT T     3    .090   12.07      10   12.160    9979       0     144       3    .077     .0       11     .2    25    14.3
9 C.T.        50    .090    7.33       6    7.425    3538       2      87       1    .143     .3       12     .1     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .1       12     .3
1 IDLE         6    .050   11.61       2   11.661    3402       0      29       0    .232     .0        7     .0     0    10.9
2 30 PCT T     6    .180   11.83       9   12.011    9979       0     302       2    .077     .0       23     .2    25    14.3
3 60 PCT T     6    .060   13.64      29   13.701   15286       1     135      11    .147     .1       20    1.6    49     8.5
4 30 PCT T     6    .090   12.03      10   12.121    9979       0     150       3    .077     .0       12     .2    25    14.3
5 10 PCT T     6    .150   11.15       4   11.301    7122       0     191       1    .057     .0       11     .0     8    18.0
6 30 PCT T     6    .110   12.06       9   12.171    9979       0     182       2    .077     .0       14     .2    25    14.3
7 90 PCT T     7    .220   14.65      66   14.871   20593       1     615      30    .113     .1       70    3.4    74     2.9
8 30 PCT T     4    .080   12.24      12   12.320    9979       0     131       3    .077     .0       10     .2    25    14.3
9 C.T.        53    .080    7.30       7    7.385    3538       3      77       1    .143     .4       11     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .0        7     .3
1 IDLE         6    .050   11.61       2   11.661    3402       0      29       0    .232     .0        7     .0     0    10.9
2 30 PCT T     6    .130   12.01      11   12.141    9979       0     216       3    .077     .0       17     .2    25    14.3
3 60 PCT T     6    .070   13.54      18   13.611   15286       1     159       7    .147     .1       23    1.0    49     8.5
4 30 PCT T     6    .120   11.85       9   11.971    9979       0     202       2    .077     .0       16     .2    25    14.3
5 10 PCT T     6    .160   10.91       4   11.071    7122       0     208       1    .057     .0       12     .0     8    18.0
6 30 PCT T    10    .120   12.17       9   12.291    9979       1     197       2    .077     .1       15     .2    25    14.3
7 90 PCT T     7    .210   14.59      64   14.801   20593       1     590      30    .113     .1       67    3.3    74     2.9
8 30 PCT T     6    .060   12.17      11   12.231    9979       0      99       3    .077     .0        8     .2    25    14.3
9 C.T.        50    .080    7.27       7    7.355    3538       2      78       1    .143     .3       11     .2     0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------   .0        7     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------   .1       15     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------   .0        7     .2
FOUR CYCLE COMPOSITE -
                                          HC- FID  0.35(      .1) + 0.65(      .0) =     .052    GM/BHP HR
                                          CO- NDIR 0.35(    14.6) + 0.65(     7.4) =    9.933    GM/BHP HR
                                          NO2-CL   0.35(      .3) + 0.65(      .2) =     .264    GM/BHP HR
                                                                  CORRECTED NO2 =     .292    GM/BHP HR
                                                                           BSFC =     .871    LB/BHP HR
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                    TABLE C-43. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 3-2   TEST 84  RUN-3  EMISSION CONT. SYSTEM  08-30-73      K =1.102      HUM =122.3  GR/LB
----------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE            HC      CO     CO2      NO   CARBON    CONS.       HC       CO     NO2   FACT.    HC        CO     NO2     HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE          38   1.120   10.34      69   11.501     3402       12      669       7   .232    2.8       155     1.6     0   10.9
2 30 PCT T      19    .790   11.03      62   11.841     9979       17     1345      17   .077    1.3       104     1.3    25   14.3
3 60 PCT T      17    .110   13.36      66   13.488    15286       21      252      25   .147    3.1        37     3.7    49    8.5
4 30 PCT T      17    .240   11.90      60   12.159     9979       15      398      16   .077    1.2        31     1.3    25   14.3
5 10 PCT T      16    .330   10.44      59   10.787     7122       11      440      13   .057     .7        25      .7     8   18.0
6 30 PCT T      17    .220   11.84      57   12.078     9979       15      367      16   .077    1.2        28     1.2    25   14.3
7 90 PCT T      18    .220   14.55     112   14.789    20593       27      619      52   .113    3.1        70     5.9    74    2.9
8 30 PCT T      18    .120   12.02      58   12.159     9979       16      199      16   .077    1.2        15     1.2    25   14.3
9 C.T.          20    .100    7.32      48    7.442     3538       10       96       8   .143    1.5        14     1.1     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .7        20      .8
1 IDLE          38    .120   10.34      69   10.501     3402       13       79       7   .232    3.1        18     1.7     0   10.9
2 30 PCT T      19    .180   11.69      54   11.891     9979       17      305      15   .077    1.3        23     1.2    25   14.3
3 60 PCT T      18    .010   13.53      62   13.559    15286       22       23      23   .147    3.2         3     3.4    49    8.5
4 30 PCT T      17    .080   11.98      54   12.078     9979       15      134      15   .077    1.2        10     1.1    25   14.3
5 10 PCT T      18    .180   10.73      54   10.929     7122       13      237      12   .057     .7        14      .7     8   18.0
6 30 PCT T      19    .070   12.18      55   12.271     9979       17      115      15   .077    1.3         9     1.1    25   14.3
7 90 PCT T      20    .150   14.60     108   14.772    20593       30      422      50   .113    3.4        48     5.6    74    2.9
8 30 PCT T      19    .030   12.16      53   12.211     9979       17       50      14   .077    1.3         4     1.1    25   14.3
9 C.T.          20   1.080    7.33      46    8.432     3538        9      915       6   .143    1.3       131      .9     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .7        11      .7
1 IDLE          19    .730   11.90      40   12.651     3402        6      397       4   .232    1.3        92      .8     0   10.9
2 30 PCT T      19    .110   12.03      51   12.161     9979       17      182      14   .077    1.3        14     1.1    25   14.3
3 60 PCT T      19    .010   13.62      62   13.651    15286       23       23      23   .147    3.4         3     3.4    49    8.5
4 30 PCT T      18    .060   12.05      52   12.129     9979       16      100      14   .077    1.2         8     1.1    25   14.3
5 10 PCT T      19    .160   10.75      55   10.931     7122       13      211      12   .057     .8        12      .7     8   18.0
6 30 PCT T      19    .060   12.13      53   12.211     9979       17       99      14   .077    1.3         8     1.1    25   14.3
7 90 PCT T      20    .170   14.61     111   14.802    20593       30      478      51   .113    3.4        54     5.8    74    2.9
8 30 PCT T      19    .030   12.20      51   12.251     9979       17       49      14   .077    1.3         4     1.1    25   14.3
9 C.T.          19    .910    7.36      46    8.291     3538        9      784       7   .143    1.3       112      .9     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .6        13      .7
1 IDLE          19    .730   11.90      40   12.651     3402        6      397       4   .232    1.3        92      .8     0   10.9
2 30 PCT T      20    .090   11.99      52   12.102     9979       18      150      14   .077    1.4        12     1.1    25   14.3
3 60 PCT T      20    .730   13.63      62   14.382    15286       23     1567      22   .147    3.4       230     3.2    49    8.5
4 30 PCT T      20    .030   12.13      52   12.182     9979       18       50      14   .077    1.4         4     1.1    25   14.3
5 10 PCT T      20    .100   11.05      52   11.172     7122       14      129      11   .057     .8         7      .6     8   18.0
6 30 PCT T      20    .040   12.14      51   12.202     9979       18       66      14   .077    1.4         5     1.1    25   14.3
7 90 PCT T      22    .210   14.66     110   14.894    20593       33      587      50   .113    3.7        66     5.7    74    2.9
8 30 PCT T      20    .020   12.17      53   12.212     9979       18       33      14   .077    1.4         3     1.1    25   14.3
9 C.T.          20    .250    7.38      46    8.152     3538        9      658       7   .143    1.3        94      .9     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .7        22      .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------      .7        16      .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------      .7        17      .7
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     .7) + 0.65(     .7) =     .670   GM/BHP HR
                                          CO- NDIR 0.35(   15.6) + 0.65(   17.3) =   16.729   GM/BHP HR
                                          NO2-NDIR 0.35(     .7) + 0.65(     .7) =     .692   GM/BHP HR
                                                             CORRECTED NO2 =     .763   GM/BHP HR
                                                                      BSFC =     .871   LB/BHP HR


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                CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.       HC       CO     NO2   FACT.  HC-FID      CO  NO2-CL    HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE           1   1.120   10.34       3   11.460     3402        0      672       0   .232     .0       156      .1     0   10.9
2 30 PCT T      62    .790   11.03       8   11.826     9979        5     1347       2   .077     .4       104      .2    25   14.3
3 60 PCT T       3    .110   13.36      34   13.470    15286        0      252      13   .147     .1        37     1.9    49    8.5
4 30 PCT T       3    .240   11.90      13   12.140     9979        0      398       4   .077     .0        31      .3    25   14.3
5 10 PCT T       2    .330   10.44       3   10.770     7122        0      441       1   .057     .0        25      .0     8   18.0
6 30 PCT T       3    .220   11.84      10   12.060     9979        0      368       3   .077     .0        28      .2    25   14.3
7 90 PCT T       1    .220   14.55      75   14.770    20593        0      620      35   .113     .0        70     3.9    74    2.9
8 30 PCT T       1    .120   12.02      12   12.140     9979        0      199       3   .077     .0        15      .3    25   14.3
9 C.T.         116    .100    7.32       7    7.432     3538        6       96       1   .143     .8        14      .2     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .1        20      .3
1 IDLE           1    .120   10.34       3   10.460     3402        0       79       0   .232     .0        18      .1     0   10.9
2 30 PCT T       1    .180   11.69       4   11.870     9979        0      306       3   .077     .0        24      .2    25   14.3
3 60 PCT T       1    .010   13.53      29   13.540    15286        0       23      11   .147     .0         3     1.6    49    8.5
4 30 PCT T       1    .080   11.98      10   12.060     9979        0      134       3   .077     .0        10      .2    25   14.3
5 10 PCT T       1    .180   10.73       3   10.910     7122        0      237       1   .057     .0        14      .0     8   18.0
6 30 PCT T       1    .070   12.18      14   12.250     9979        0      115       4   .077     .0         9      .3    25   14.3
7 90 PCT T       3    .150   14.60      69   14.750    20593        0      423      32   .113     .1        48     3.6    74    2.9
8 30 PCT T       1    .030   12.16      11   12.190     9979        0       50       3   .077     .0         4      .2    25   14.3
9 C.T.         114   1.080    7.33       7    8.421     3538        5      917       1   .143     .7       131      .1     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .0        11      .3
1 IDLE           1    .730   11.90       2   12.630     3402        0      397       0   .232     .0        92      .0     0   10.9
2 30 PCT T       1    .110   12.03      11   12.140     9979        0      183       3   .077     .0        14      .2    25   14.3
3 60 PCT T       1    .010   13.62      29   13.630    15286        0       23      11   .147     .0         3     1.6    49    8.5
4 30 PCT T       1    .060   12.05      11   12.110     9979        0      100       3   .077     .0         8      .2    25   14.3
5 10 PCT T       1    .160   10.75       3   10.910     7122        0      211       1   .057     .0        12      .0     8   18.0
6 30 PCT T       1    .060   12.13       4   12.190     9979        0       99       2   .077     .0         8      .2    25   14.3
7 90 PCT T       2    .170   14.61      69   14.780    20593        0      478      32   .113     .0        54     3.6    74    2.9
8 30 PCT T       1    .030   12.20      12   12.230     9979        0       49       3   .077     .0         4      .3    25   14.3
9 C.T.         111    .910    7.36       7    8.281     3538        5      785       1   .143     .7       112      .1     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .0        13      .3
1 IDLE           1    .730   11.90       2   12.630     3402        0      397       0   .232     .0        92      .0     0   10.9
2 30 PCT T       1    .090   11.99      10   12.080     9979        0      150       3   .077     .0        12      .2    25   14.3
3 60 PCT T       1    .730   13.63      29   14.360    15286        0     1570      10   .147     .0       231     1.5    49    8.5
4 30 PCT T       1    .030   12.13      11   12.160     9979        0       50       3   .077     .0         4      .2    25   14.3
5 10 PCT T       1    .100   11.05       4   11.150     7122        0      129       1   .057     .0         7      .0     8   18.0
6 30 PCT T       1    .040   12.14      10   12.180     9979        0       66       3   .077     .0         5      .2    25   14.3
7 90 PCT T       2    .210   14.66      69   14.870    20593        0      587      32   .113     .0        66     3.6    74    2.9
8 30 PCT T       1    .020   12.17      11   12.190     9979        0       33       3   .077     .0         3      .2    25   14.3
9 C.T.         120    .250    7.38       7    8.152     3538        5      658       1   .143     .7        94      .1     0   22.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------      .0        22      .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------      .0        16      .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------      .0        17      .3
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     .0) + 0.65(     .0) =     .038   GM/BHP HR
                                          CO- NDIR 0.35(   15.6) + 0.65(   17.4) =   16.756   GM/BHP HR
                                          NO2-CL   0.35(     .3) + 0.65(     .3) =     .271   GM/BHP HR
                                                             CORRECTED NO2 =     .299   GM/BHP HR
                                                                      BSFC =     .871   LB/BHP HR
```

TABLE C-44. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 3-00 TEST 95 RUN 1 1972 STANDARD ENGINE 09-14-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.9	4.8	20.9	0	2717	.450	10.10	37
2	1200	5.0	1	19.9	7.8	16.2	0	1806	1.430	13.43	75
3	1200	19.0	4	18.7	8.6	16.2	0	1730	.650	13.88	133
4	1200	44.0	10	16.6	10.2	16.5	0	1246	.330	14.03	270
5	1200	62.0	14	15.0	11.7	16.1	0	1076	.190	14.18	425
6	1200	123.0	28	9.3	16.9	16.1	0	863	.120	14.03	1050
7	1200	182.0	42	5.1	21.4	15.3	0	2051	.400	14.65	1750
8	1200	199.0	45	3.8	23.0	15.0	0	2167	.550	14.65	1975
9	1200	224.0	51	1.8	24.8	14.8	0	2345	1.220	14.33	1925
10	1200	240.0	55	.7	26.2	13.0	0	3855	6.080	14.03	640
11	600	0.0	0	16.2	4.5	16.7	0	2279	.820	11.28	51
12	1200	0.0	0	22.4	4.7	21.4	0	27585	.610	6.87	14
13	2300	255.0	112	.6	64.0	11.9	0	4366	8.050	10.56	545
14	2300	238.0	104	2.4	55.4	12.8	0	2750	5.510	12.18	510
15	2300	212.0	93	4.6	46.9	13.6	0	2396	3.460	13.29	1012
16	2300	194.0	85	5.9	44.3	13.8	0	2134	3.010	13.58	1137
17	2300	130.0	57	10.2	30.8	15.4	0	342	.210	14.81	1450
18	2300	65.0	28	15.3	22.0	15.7	0	112	.090	14.65	675
19	2300	47.0	21	16.8	19.2	15.9	0	25	.080	14.49	463
20	2300	21.0	9	18.8	15.6	16.0	0	29	.060	14.33	240
21	2300	5.0	2	20.0	13.4	16.0	0	20	.050	14.33	167
22	600	0.0	0	16.4	4.7	17.5	0	3152	.910	11.04	47
23	2300	0.0	0	24.7	4.9	24.0	0	28167	.240	6.13	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	54.7	183	2.5	.070	0.0	I	R	R	R
2	0.0	42.5	679	5.9	.060	.1	0.0	37.19	594.8	5.1
3	0.0	45.9	348	11.7	.060	.3	0.0	10.57	80.2	2.7
4	0.0	39.8	213	28.6	.050	.5	0.0	3.96	21.2	2.8
5	0.0	39.5	141	51.7	.030	.4	0.0	2.79	9.9	3.7
6	0.0	46.5	131	187.7	.060	1.7	0.0	1.65	4.6	6.7
7	0.0	130.5	514	369.7	0.000	0.0	0.0	3.14	12.4	8.9
8	0.0	146.7	752	443.7	.040	1.8	0.0	3.23	16.5	9.8
9	0.0	167.1	1756	455.5	0.000	0.0	0.0	3.27	34.3	8.9
10	0.0	223.5	7122	123.2	0.000	0.0	0.0	4.08	129.9	2.2
11	0.0	37.7	274	2.8	.070	0.0	I	R	R	R
12	0.0	574.4	257	1.0	.120	0.0	I	R	R	R
13	0.0	665.5	24785	275.8	.025	2.8	0.0	5.96	221.9	2.5
14	0.0	384.6	15569	236.8	.055	5.7	0.0	3.69	149.4	2.3
15	0.0	300.1	8752	420.7	.035	3.2	0.0	3.23	94.3	4.5
16	0.0	255.2	7271	451.4	.060	5.1	0.0	3.00	85.6	5.3
17	0.0	31.7	394	446.8	.060	3.4	0.0	.56	6.9	7.8
18	0.0	7.6	123	151.6	0.000	0.0	0.0	.27	4.3	5.3
19	0.0	4.5	97	91.8	.065	1.3	0.0	.22	4.7	4.5
20	0.0	1.4	60	39.2	0.000	0.0	0.0	.16	6.5	4.3
21	0.0	.9	43	23.4	0.000	0.0	0.0	.39	19.5	10.7
22	0.0	54.8	320	2.7	.080	0.0	I	R	R	R
23	0.0	681.5	117	1.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.716	GRAM/BHP HR
	CO	93.161	GRAM/BHP HR
	NO2	4.863	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.671	LB/BHP HR

TABLE C-45. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 3-00 TEST 95 RUN 2 1972 STANDARD ENGINE 09-14-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	600	0.0	0	16.5	4.6	19.9	0	1990	.950	10.44	47
2	1200	7.0	2	19.8	7.9	15.8	0	1984	1.720	12.72	83
3	1200	21.0	5	18.8	8.8	15.7	0	1812	1.190	13.14	131
4	1200	44.0	10	16.7	10.7	16.1	0	1385	.530	13.58	260
5	1200	61.0	14	15.2	11.9	16.2	0	1243	.300	13.73	425
6	1200	123.0	28	9.4	16.6	16.8	0	872	.120	13.43	1113
7	1200	184.0	42	5.2	22.0	15.6	0	2070	.480	14.03	1825
8	1200	201.0	46	3.6	23.2	15.5	0	2185	.700	13.88	1925
9	1200	224.0	51	1.9	26.1	15.1	0	2364	1.480	13.58	1675
10	1200	242.0	55	.4	32.2	13.0	0	3763	6.020	11.04	650
11	600	0.0	0	16.6	4.8	18.7	0	2495	1.190	10.56	54
12	1200	0.0	0	22.3	4.6	22.8	0	26267	.670	4.81	13
13	2300	259.0	113	.6	67.6	12.0	0	4301	8.640	9.77	450
14	2300	238.0	104	2.5	54.3	13.2	0	2892	5.270	11.66	538
15	2300	210.0	92	4.8	46.1	14.3	0	2295	2.960	13.00	1225
16	2300	194.0	85	6.0	43.8	14.5	0	2032	2.660	13.00	1325
17	2300	128.0	56	10.3	30.7	16.3	0	368	.130	14.03	1525
18	2300	65.0	28	15.5	21.6	16.4	0	127	.090	14.03	700
19	2300	47.0	21	16.9	19.3	16.4	0	78	.080	14.03	510
20	2300	21.0	9	18.9	15.9	16.6	0	28	.050	14.03	265
21	2300	5.0	2	20.1	13.5	16.6	0	19	.050	14.03	180
22	600	0.0	0	16.6	4.7	20.7	0	2924	.720	10.44	50
23	2300	0.0	0	24.7	4.9	24.3	0	26913	.230	6.21	15

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	35.8	346	2.8	.070	0.0	I	R	R	R
2	0.0	48.6	851	6.7	.060	.1	0.0	30.36	531.8	4.2
3	0.0	49.8	661	12.0	.060	.3	0.0	10.39	137.8	2.5
4	0.0	47.2	365	29.4	.050	.5	0.0	4.69	36.3	2.9
5	0.0	47.4	231	53.8	.030	.4	0.0	3.40	16.6	3.9
6	0.0	48.2	134	204.0	.060	1.7	0.0	1.71	4.8	7.3
7	0.0	140.4	657	410.8	0.000	0.0	0.0	3.34	15.6	9.8
8	0.0	155.4	1006	454.5	.040	1.8	0.0	3.38	21.9	9.9
9	0.0	183.0	2314	430.4	0.000	0.0	0.0	3.58	45.2	8.4
10	0.0	315.2	10186	180.8	0.000	0.0	0.0	5.70	184.2	3.3
11	0.0	45.3	436	3.3	.070	0.0	I	R	R	R
12	0.0	676.1	348	1.1	.120	0.0	I	R	R	R
13	0.0	700.0	28405	243.2	.025	2.8	0.0	6.17	250.4	2.1
14	0.0	413.6	15227	255.5	.055	5.7	0.0	3.97	146.1	2.5
15	0.0	296.5	7723	525.3	.035	3.2	0.0	3.22	84.0	5.7
16	0.0	254.5	6730	550.9	.060	5.1	0.0	3.00	79.2	6.5
17	0.0	36.1	258	496.6	.060	3.4	0.0	.64	4.6	8.9
18	0.0	8.8	126	161.1	0.000	0.0	0.0	.31	4.4	5.7
19	0.0	4.8	100	105.0	.065	1.3	0.0	.24	4.9	5.1
20	0.0	1.4	52	45.1	0.000	0.0	0.0	.16	5.6	4.9
21	0.0	.8	44	26.0	0.000	0.0	0.0	.38	20.1	11.9
22	0.0	54.4	271	3.1	.080	0.0	I	R	R	R
23	0.0	655.1	113	1.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	8.239	GRAM/BHP HR
	CO	95.890	GRAM/BHP HR
	NO2	5.440	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.671	LB/BHP HR

TABLE C-46. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 3-00 TEST 95 RUN 3 1972 STANDARD ENGINE 09-14-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	16.6	4.8	20.2	0	3460	.640	9.99	45
2	1200	5.3	1	19.8	8.1	16.1	0	1612	1.070	13.14	118
3	1200	19.3	4	18.7	8.6	15.9	0	1641	1.130	13.14	135
4	1200	43.8	10	16.7	10.7	16.4	0	1099	.360	13.43	285
5	1200	61.3	14	15.0	12.1	16.6	0	902	.180	13.58	450
6	1200	123.0	28	9.3	16.8	17.0	0	842	.110	13.14	1138
7	1200	182.0	42	5.1	21.7	15.8	0	2009	.360	13.88	1988
8	1200	198.0	45	3.9	22.9	15.7	0	2125	.560	13.88	1975
9	1200	224.0	51	1.9	25.8	15.3	0	2302	1.360	13.43	1800
10	1200	242.0	55	.4	32.6	13.2	0	3839	6.150	13.43	625
11	600	0.0	0	16.5	4.7	18.3	0	2098	1.220	13.29	51
12	1200	0.0	0	22.4	4.6	21.0	0	27376	.550	6.95	14
13	2300	259.0	113	.6	68.2	11.9	0	4409	8.730	9.44	410
14	2300	236.0	103	2.7	54.5	13.8	0	2563	3.950	12.45	537
15	2300	214.0	94	4.6	46.7	14.3	0	2462	2.830	12.86	1275
16	2300	194.0	85	6.1	43.4	14.5	0	2200	2.580	12.86	1350
17	2300	130.0	57	10.2	30.5	16.4	0	310	.110	13.73	1563
18	2300	6.5	3	15.5	21.4	16.5	0	97	.070	13.73	713
19	2300	47.0	21	16.9	19.4	16.4	0	70	.070	13.73	513
20	2300	21.0	9	19.1	15.4	16.6	0	30	.050	13.73	260
21	2300	7.0	3	20.1	13.9	16.7	0	21	.040	13.73	180
22	600	0.0	0	16.6	4.7	19.3	0	3340	.820	10.44	128
23	2300	0.0	0	24.7	4.8	23.8	0	28207	.240	6.29	14

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	68.6	256	3.0	.070	0.0	I	R	R	R
2	0.0	41.2	553	10.0	.060	.1	0.0	34.04	456.3	8.3
3	0.0	44.4	617	12.1	.060	.3	0.0	10.06	139.9	2.7
4	0.0	38.4	254	33.0	.050	.5	0.0	3.84	25.4	3.3
5	0.0	35.7	144	59.2	.030	.4	0.0	2.55	10.3	4.2
6	0.0	48.1	127	215.9	.060	1.7	0.0	1.71	4.5	7.7
7	0.0	136.9	496	449.9	0.000	0.0	0.0	3.29	11.9	10.8
8	0.0	150.7	802	464.8	.040	1.8	0.0	3.33	17.7	10.3
9	0.0	179.4	2140	465.6	0.000	0.0	0.0	3.50	41.8	9.1
10	0.0	284.3	9202	153.7	0.000	0.0	0.0	5.14	166.4	2.8
11	0.0	30.4	357	2.5	.070	0.0	I	R	R	R
12	0.0	558.0	226	.9	.120	0.0	I	R	R	R
13	0.0	733.0	29313	226.3	.025	2.8	0.0	6.46	258.4	2.0
14	0.0	380.3	11842	264.6	.055	5.7	0.0	3.68	114.6	2.6
15	0.0	327.3	7599	562.7	.035	3.3	0.0	3.49	81.1	6.0
16	0.0	276.6	6552	563.4	.060	5.1	0.0	3.26	77.1	6.6
17	0.0	30.9	222	517.6	.060	3.4	0.0	.54	3.9	9.1
18	0.0	6.8	99	166.4	0.000	0.0	0.0	2.39	34.9	58.5
19	0.0	4.5	90	108.6	.065	1.3	0.0	.22	4.4	5.3
20	0.0	1.5	51	43.7	0.000	0.0	0.0	.17	5.6	4.8
21	0.0	1.0	37	27.4	0.000	0.0	0.0	.32	12.1	8.9
22	0.0	61.4	305	7.8	.080	0.0	I	R	R	R
23	0.0	656.8	113	1.1	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	7.752	GRAM/BHP HR
	CO	86.745	GRAM/BHP HR
	NO2	5.655	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.672	LB/BHP HR

TABLE C-47. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 3-0 TEST 88 RUN-1 1973 STANDARD ENGINE 09-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	600	0.0	0	15.5	5.0	19.3	0	4396	.590	10.10	51
2	1200	5.0	1	19.5	7.8	16.0	0	1123	.670	12.59	78
3	1200	18.0	4	19.0	8.4	15.6	0	1856	1.070	12.45	106
4	1200	37.0	8	18.1	8.6	15.8	0	1027	.720	12.72	196
5	1200	53.0	12	16.7	10.3	15.9	0	955	.360	13.00	360
6	1200	107.0	24	11.5	13.6	16.1	0	1456	.100	12.86	1025
7	1200	156.0	36	6.1	20.5	15.1	0	1805	.580	13.29	1175
8	1200	172.0	39	5.1	21.4	14.8	0	1979	.850	13.29	1225
9	1200	193.0	44	3.3	23.3	14.9	0	2126	.560	13.14	1550
10	1200	214.0	49	.9	26.7	14.4	0	2263	1.480	12.72	1325
11	600	0.0	0	15.5	5.2	19.4	0	2142	.750	9.88	55
12	1200	0.0	0	21.5	5.3	21.5	0	34899	.250	6.97	11
13	2300	240.0	105	.6	68.5	11.2	0	4668	8.730	9.33	330
14	2300	219.0	96	3.3	50.1	13.2	0	2847	3.930	12.31	660
15	2300	196.0	86	5.2	46.0	13.3	0	2581	3.190	12.72	800
16	2300	179.0	78	6.6	43.3	13.4	0	2519	2.830	12.86	790
17	2300	119.0	52	10.8	28.6	15.8	0	259	.100	13.58	1250
18	2300	60.0	26	16.0	19.7	16.1	0	225	.110	13.43	620
19	2300	40.0	18	17.5	17.3	16.1	0	141	.100	13.43	400
20	2300	19.0	8	19.5	14.4	15.9	0	113	.120	13.73	230
21	2300	7.0	3	20.4	13.0	15.9	0	88	.110	13.58	160
22	600	0.0	0	15.5	5.3	20.6	0	4092	.410	9.44	50
23	2300	0.0	0	24.1	5.3	24.4	0	26634	.190	5.97	12

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	89.6	243	3.5	.070	0.0	I	R	R	R
2	0.0	29.7	358	6.9	.060	.1	0.0	26.00	313.4	6.0
3	0.0	51.6	601	9.8	.060	.2	0.0	12.55	146.1	2.4
4	0.0	29.6	419	18.7	.050	.4	0.0	3.50	49.6	2.2
5	0.0	33.2	253	41.5	.030	.4	0.0	2.74	20.9	3.4
6	0.0	68.5	95	160.2	.060	1.5	0.0	2.80	3.9	6.6
7	0.0	119.5	775	258.2	0.000	0.0	0.0	3.35	21.8	7.2
8	0.0	134.0	1162	275.3	.040	1.6	0.0	3.41	29.6	7.0
9	0.0	161.5	859	390.9	0.000	0.0	0.0	3.66	19.5	8.9
10	0.0	190.0	2510	369.3	0.000	0.0	0.0	3.88	51.3	7.6
11	0.0	46.6	330	4.0	.070	0.0	I	R	R	R
12	0.0	864.1	125	.9	.120	0.0	I	R	R	R
13	0.0	782.9	29575	183.7	.025	2.6	0.0	7.45	281.4	1.7
14	0.0	391.5	10917	301.3	.055	5.3	0.0	4.08	113.8	3.1
15	0.0	333.1	8316	342.8	.035	3.0	0.0	3.88	96.9	4.0
16	0.0	310.4	7043	323.1	.060	4.7	0.0	3.96	89.8	4.1
17	0.0	24.5	191	392.8	.060	3.1	0.0	.47	3.7	7.5
18	0.0	14.8	146	135.6	0.000	0.0	0.0	.56	5.6	5.2
19	0.0	8.1	117	76.9	.065	1.1	0.0	.47	6.7	4.4
20	0.0	5.3	114	36.0	0.000	0.0	0.0	.64	13.7	4.3
21	0.0	3.8	96	22.9	0.000	0.0	0.0	1.23	31.2	7.5
22	0.0	95.9	194	3.9	.080	0.0	I	R	R	R
23	0.0	726.5	99	1.1	.060	0.0	I	R	R	R

CYCLE COMPOSITE
HC 10.605 GRAM/BHP HR
CO 95.246 GRAM/BHP HR
NO2 4.411 GRAM/BHP HR
ALDE 0.000 GRAM/BHP HR
BSFC .708 LB/BHP HR

TABLE C-48. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 3-0   TEST 88   RUN-2   1973 STANDARD ENGINE   09-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	600	0.0	0	15.5	5.2	20.8	0	2727	.590	9.23	45
2	1200	5.0	1	19.5	7.9	15.8	0	1349	1.240	12.18	80
3	1200	18.0	4	19.0	8.3	16.0	0	1458	.970	12.18	105
4	1200	39.0	4	17.9	9.2	16.5	0	1062	.190	12.59	245
5	1200	50.0	11	16.4	10.2	16.9	0	921	.120	12.45	340
6	1200	107.0	24	11.3	14.5	17.3	0	976	.110	12.31	830
7	1200	157.0	36	6.1	20.5	15.3	0	1579	.670	13.14	1187
8	1200	172.0	39	5.0	21.4	15.1	0	1692	.680	13.14	1300
9	1200	193.0	44	3.3	23.2	15.0	0	1834	.500	13.43	1625
10	1200	215.0	49	.9	26.5	14.4	0	1816	1.860	12.72	1200
11	600	0.0	0	15.5	5.0	20.2	0	1586	.720	9.44	50
12	1200	0.0	0	21.5	5.3	22.3	0	33800	.270	5.81	16
13	2300	238.0	104	.6	68.0	11.2	0	4296	8.820	9.44	350
14	2300	219.0	96	3.3	50.7	13.0	0	2646	3.950	12.31	670
15	2300	196.0	86	5.3	45.8	13.2	0	2439	3.280	12.72	800
16	2300	179.0	78	6.6	42.5	13.5	0	2290	2.700	13.00	930
17	2300	119.0	52	10.8	28.4	15.9	0	198	.100	13.43	1225
18	2300	60.0	26	16.0	19.8	16.1	0	157	.110	13.29	582
19	2300	40.0	18	17.5	17.2	16.2	0	109	.090	13.29	400
20	2300	19.0	8	19.5	14.7	16.2	0	74	.080	13.29	230
21	2300	7.0	3	20.2	12.7	16.5	0	56	.070	13.14	150
22	600	0.0	0	15.4	5.2	21.2	0	2988	.340	9.02	55
23	2300	0.0	0	24.1	5.2	23.8	0	27097	.190	6.13	12

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDF.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	63.7	279	3.5	.070	0.0	I	R	R	R
2	0.0	35.7	662	7.0	.060	.1	0.0	31.22	579.6	6.1
3	0.0	41.3	555	9.9	.060	.2	0.0	10.04	134.9	2.4
4	0.0	34.4	124	26.3	.050	.4	0.0	3.86	13.9	3.0
5	0.0	33.7	89	41.2	.030	.3	0.0	2.95	7.8	3.6
6	0.0	51.3	117	144.8	.060	1.5	0.0	2.10	4.8	5.9
7	0.0	105.1	901	262.4	0.000	0.0	0.0	2.93	25.1	7.3
8	0.0	117.4	953	299.5	.040	1.6	0.0	2.99	24.3	7.6
9	0.0	136.8	753	402.3	0.000	0.0	0.0	3.10	17.1	9.1
10	0.0	147.9	3059	324.4	0.000	0.0	0.0	3.01	62.3	6.6
11	0.0	34.9	320	3.6	.070	0.0	I	R	R	R
12	0.0	859.0	139	1.3	.120	0.0	I	R	R	R
13	0.0	709.0	29404	191.8	.025	2.6	0.0	6.80	282.1	1.8
14	0.0	368.2	11104	309.6	.055	5.3	0.0	3.84	115.8	3.2
15	0.0	312.0	8474	339.7	.035	3.0	0.0	3.63	98.7	4.0
16	0.0	277.2	6601	373.7	.060	4.7	0.0	3.54	84.2	4.8
17	0.0	18.8	192	386.7	.060	3.1	0.0	.36	3.7	7.4
18	0.0	10.5	149	130.7	0.000	0.0	0.0	.40	5.7	5.0
19	0.0	6.4	106	77.4	.065	1.1	0.0	.36	6.0	4.4
20	0.0	3.7	81	38.1	0.000	0.0	0.0	.44	9.7	4.1
21	0.0	2.4	62	21.7	0.000	0.0	0.0	.80	20.1	7.1
22	0.0	73.0	168	4.5	.080	0.0	I	R	R	R
23	0.0	707.8	100	1.0	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	10.021	GRAM/BHP HR
	CO	94.259	GRAM/BHP HR
	NO2	4.571	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.709	LB/BHP HR

TABLE C-49. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 3-0 TEST 88 RUN-3 1973 STANDARD ENGINE 09-06-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.4	5.1	16.3	0	3818	.270	9.55	50
2	1200	5.0	1	19.4	8.0	15.6	0	1269	1.160	12.72	80
3	1200	18.0	4	19.0	8.4	16.1	0	1295	.780	12.86	120
4	1200	39.0	9	17.6	8.9	16.5	0	897	.140	13.00	235
5	1200	53.0	12	16.5	10.0	16.5	0	981	.110	13.00	335
6	1200	105.0	24	11.2	14.4	16.8	0	1008	.110	12.86	800
7	1200	156.0	36	6.1	20.5	15.1	0	1416	.610	13.73	1200
8	1200	172.0	39	5.1	21.2	15.0	0	1756	.670	13.73	1350
9	1200	193.0	44	3.3	23.1	15.0	0	1811	.410	13.88	1700
10	1200	215.0	49	.9	26.4	14.7	0	1845	1.070	13.58	1500
11	600	0.0	0	15.5	4.9	19.2	0	2751	.740	10.10	55
12	1200	0.0	0	21.5	5.2	22.0	0	35269	.240	5.81	15
13	2300	240.0	105	.6	68.4	11.2	0	4151	8.640	9.66	400
14	2300	219.0	96	3.3	50.2	14.7	0	2559	3.900	12.31	690
15	2300	196.0	86	5.2	45.7	13.3	0	2319	3.100	12.59	830
16	2300	177.0	78	6.7	42.6	13.4	0	2264	2.960	12.86	850
17	2300	119.0	52	10.7	28.7	15.8	0	194	.090	13.58	1262
18	2300	60.0	26	16.0	19.4	16.1	0	137	.090	13.29	612
19	2300	44.0	19	17.3	17.5	16.2	0	109	.080	13.29	437
20	2300	19.0	8	19.3	14.6	16.0	0	82	.100	13.29	250
21	2300	7.0	3	20.4	12.8	16.1	0	66	.090	13.43	175
22	600	0.0	0	15.5	4.9	21.0	0	2452	.380	9.33	60
23	2300	0.0	0	24.1	5.2	24.7	0	27424	.180	5.74	9

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	86.6	124	3.8	.070	0.0	I	R	R	R
2	0.0	32.9	607	6.9	.060	.1	0.0	28.79	531.4	6.0
3	0.0	35.8	436	11.0	.060	.2	0.0	8.71	106.0	2.7
4	0.0	27.4	86	23.8	.050	.4	0.0	3.07	9.7	2.7
5	0.0	33.7	76	38.2	.030	.4	0.0	2.78	6.3	3.2
6	0.0	50.4	111	132.7	.060	1.4	0.0	2.10	4.6	5.5
7	0.0	90.9	791	255.8	0.000	0.0	0.0	2.55	22.2	7.2
8	0.0	115.9	893	295.7	.040	1.6	0.0	2.95	22.7	7.5
9	0.0	131.2	600	408.7	0.000	0.0	0.0	2.97	13.6	9.3
10	0.0	149.0	1745	402.0	0.000	0.0	0.0	3.03	35.5	8.2
11	0.0	55.0	299	3.7	.070	0.0	I	R	R	R
12	0.0	868.7	119	1.2	.120	0.0	I	R	R	R
13	0.0	688.1	28934	220.2	.025	2.6	0.0	6.55	275.3	2.1
14	0.0	353.8	10895	316.8	.055	5.3	0.0	3.69	113.6	3.3
15	0.0	301.9	8153	358.8	.035	3.0	0.0	3.52	95.0	4.2
16	0.0	272.6	7200	339.8	.060	4.7	0.0	3.52	92.9	4.4
17	0.0	18.4	173	398.4	.060	3.1	0.0	.35	3.3	7.6
18	0.0	9.0	119	133.5	0.000	0.0	0.0	.34	4.5	5.1
19	0.0	6.5	96	86.1	.065	1.3	0.0	.34	5.0	4.5
20	0.0	4.1	100	41.0	0.000	0.0	0.0	.49	12.0	4.9
21	0.0	2.8	78	24.9	0.000	0.0	0.0	.93	25.5	8.1
22	0.0	54.7	171	4.4	.080	0.0	I	R	R	R
23	0.0	746.7	99	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	10.078	GRAM/BHP HR
	CO	92.706	GRAM/BHP HR
	NO2	4.555	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.704	LB/BHP HR

TABLE C-50. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 3-1X TEST 93 RUN 1 EGR-CAT-2-AIR 09-11-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.5	5.2	27.4	0	167	.060	7.57	57
2	1200	5.0	1	17.6	8.6	27.0	0	117	.060	7.94	36
3	1200	16.0	4	17.0	8.9	26.0	0	66	.060	8.22	57
4	1200	37.0	8	15.4	10.4	24.4	0	57	.060	8.82	93
5	1200	51.0	12	14.1	11.4	23.9	0	76	.060	9.02	135
6	1200	102.0	23	9.0	16.6	20.6	0	70	.060	10.33	320
7	1200	154.0	35	3.2	21.3	18.9	0	61	.060	11.41	555
8	1200	163.0	37	2.7	22.2	18.6	0	56	.060	11.53	730
9	1200	187.0	43	2.4	23.5	18.2	0	53	.060	11.79	1100
10	1200	215.0	49	1.0	26.8	13.7	0	42	3.120	12.59	1000
11	600	0.0	0	15.6	4.9	27.2	0	73	.030	7.84	57
12	1200	0.0	0	21.4	5.2	42.4	0	738	.030	5.81	10
13	2300	215.0	94	1.0	0.0	12.8	0	715	4.750	12.05	250
14	2300	200.0	88	2.2	57.0	14.4	0	82	1.270	13.58	140
15	2300	179.0	78	3.6	45.0	16.4	0	6	.060	13.29	362
16	2300	163.0	71	4.6	42.1	16.8	0	3	.060	12.86	412
17	2300	109.0	48	9.8	29.3	20.7	0	13	.030	10.33	587
18	2300	54.0	24	14.7	20.5	24.0	0	25	.030	8.92	237
19	2300	39.0	17	15.8	18.5	24.9	0	29	.030	8.62	140
20	2300	19.0	8	16.9	17.2	25.4	0	29	.030	8.22	98
21	2300	5.0	2	18.0	15.3	27.0	0	29	.030	7.84	69
22	600	0.0	0	15.5	5.1	27.3	0	234	.030	7.75	56
23	2300	0.0	0	23.8	5.3	51.6	0	1869	.400	3.74	2

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	5.2	37	5.8	.070	0.0	I	R	R	R
2	0.0	5.7	59	5.8	.060	.1	0.0	4.99	51.7	5.1
3	0.0	3.2	59	9.2	.060	.2	0.0	.88	16.2	2.5
4	0.0	3.0	64	16.4	.050	.4	0.0	.36	7.6	1.9
5	0.0	4.3	69	25.5	.030	.3	0.0	.37	5.9	2.2
6	0.0	5.1	88	76.9	.060	1.4	0.0	.22	3.8	3.3
7	0.0	5.1	102	155.1	0.000	0.0	0.0	.15	2.9	4.4
8	0.0	4.9	105	210.5	.040	1.5	0.0	.13	2.8	5.7
9	0.0	4.8	109	328.4	0.000	0.0	0.0	.11	2.6	7.7
10	0.0	3.3	4876	256.8	0.000	0.0	0.0	.07	99.2	5.2
11	0.0	2.1	17	5.3	.070	0.0	I	R	R	R
12	0.0	29.4	24	1.3	.120	0.0	I	R	R	R
13	0.0	0.0	0	0.0	.025	2.4	0.0	0.00	0.0	0.0
14	0.0	14.2	4464	80.9	.055	4.8	0.0	.16	51.0	.9
15	0.0	.9	185	183.8	.035	2.7	0.0	.01	2.4	2.3
16	0.0	.5	179	202.2	.060	4.3	0.0	.01	2.5	2.8
17	0.0	1.7	78	250.0	.060	2.9	0.0	.04	1.6	5.2
18	0.0	2.6	63	81.7	0.000	0.0	0.0	.11	2.7	3.5
19	0.0	2.8	59	45.1	.065	1.1	0.0	.17	3.4	2.6
20	0.0	2.7	57	30.8	0.000	0.0	0.0	.33	6.9	3.7
21	0.0	2.6	53	20.2	0.000	0.0	0.0	1.17	24.4	9.2
22	0.0	6.9	18	5.5	.080	0.0	I	R	R	R
23	0.0	103.8	449	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.600	GRAM/BHP HR
	CO	14.836	GRAM/BHP HR
	NO2	2.616	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.726	LB/BHP HR

TABLE C-51. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 3-1X TEST 93 RUN 2 EGR-CAT-2-AIR 09-11-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	DRY CONCENTRATION ALDE.	HC	CO	CO2	NO
1	600	0.0	0	15.6	5.1	27.2	0	224	.060	7.75	52
2	1200	5.0	1	17.6	8.4	26.8	0	168	.060	7.94	33
3	1200	16.0	4	16.9	9.0	25.2	0	78	.060	8.32	55
4	1200	35.0	8	15.3	10.5	24.4	0	84	.060	8.62	88
5	1200	53.0	12	14.1	11.4	23.3	0	81	.060	9.02	137
6	1200	102.0	23	8.7	16.7	20.3	0	74	.060	10.44	330
7	1200	152.0	35	3.2	19.9	18.9	0	61	.060	11.41	580
8	1200	165.0	38	2.8	21.8	18.6	0	53	.060	11.53	710
9	1200	187.0	43	2.3	23.7	18.1	0	57	.060	11.92	1125
10	1200	210.0	48	.7	32.2	14.3	0	152	1.720	13.43	1075
11	600	0.0	0	15.6	4.9	26.6	0	20	.080	7.94	64
12	1200	0.0	0	21.3	5.1	43.7	0	789	.030	5.66	10
13	2300	215.0	94	.6	0.0	12.9	0	823	4.640	12.05	220
14	2300	198.0	87	2.4	56.5	14.6	0	78	1.020	13.73	180
15	2300	180.0	79	3.4	45.7	16.4	0	9	.010	12.86	410
16	2300	163.0	71	4.5	42.6	16.8	0	13	.060	13.14	635
17	2300	107.0	47	9.6	29.7	22.6	0	30	.030	10.44	635
18	2300	54.0	24	14.3	21.0	24.5	0	29	.030	8.92	165
19	2300	39.0	17	15.5	19.4	25.1	0	30	.030	8.52	100
20	2300	18.0	8	17.4	16.6	24.9	0	42	.030	8.13	77
21	2300	5.0	2	18.4	14.5	27.2	0	33	.030	7.79	76
22	600	0.0	0	15.4	5.0	25.5	0	304	.030	7.57	53
23	2300	0.0	0	23.8	5.3	51.2	0	1661	.370	3.74	2

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	6.6	36	5.1	.070	0.0	I	R	R	R
2	0.0	8.0	58	5.2	.060	.1	0.0	6.97	50.4	4.6
3	0.0	3.8	59	8.9	.060	.2	0.0	1.03	16.1	2.4
4	0.0	4.6	66	16.0	.050	.4	0.0	.58	8.3	2.0
5	0.0	4.6	69	25.9	.030	.4	0.0	.38	5.7	2.1
6	0.0	5.3	87	79.0	.060	1.4	0.0	.23	3.7	3.4
7	0.0	4.8	95	151.5	0.000	0.0	0.0	.14	2.7	4.4
8	0.0	4.5	103	201.0	.040	1.5	0.0	.12	2.7	5.3
9	0.0	5.1	109	335.0	0.000	0.0	0.0	.12	2.5	7.8
10	0.0	14.6	3346	343.7	0.000	0.0	0.0	.30	69.7	7.2
11	0.0	.6	45	5.9	.070	0.0	I	R	R	R
12	0.0	31.7	24	1.3	.120	0.0	I	R	R	R
13	0.0	0.0	0	0.0	.025	2.4	0.0	0.00	0.0	0.0
14	0.0	13.6	3578	103.8	.055	4.8	0.0	.16	41.3	1.2
15	0.0	1.4	33	219.2	.035	2.8	0.0	.02	.4	2.8
16	0.0	2.0	177	308.6	.060	4.3	0.0	.03	2.5	4.3
17	0.0	3.8	78	271.2	.060	2.8	0.0	.08	1.7	5.8
18	0.0	3.1	64	58.3	0.000	0.0	0.0	.13	2.7	2.5
19	0.0	3.1	62	34.2	.065	1.1	0.0	.18	3.7	2.0
20	0.0	3.9	56	23.6	0.000	0.0	0.0	.49	7.1	3.0
21	0.0	2.8	51	21.2	0.000	0.0	0.0	1.28	23.3	9.7
22	0.0	9.0	18	5.2	.080	0.0	I	R	R	R
23	0.0	93.4	420	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	.615	GRAM/BHP HR
	CO	12.442	GRAM/BHP HR
	NO2	3.038	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.731	LB/BHP HR

TABLE C-52. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 3-1X TEST 93 RUN 3 EGR-CAT-2-AIR 09-11-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.6	4.9	27.1	0	114	.060	7.66	66
2	1200	5.0	1	17.4	8.4	26.3	0	137	.060	7.94	36
3	1200	18.0	4	16.2	9.3	25.3	0	101	.060	8.22	51
4	1200	37.0	8	14.8	10.6	24.2	0	79	.060	8.72	92
5	1200	51.0	12	14.0	11.4	23.3	0	87	.060	9.02	135
6	1200	103.0	24	7.0	18.6	19.4	0	40	.060	11.04	245
7	1200	152.0	35	3.2	21.0	18.9	0	62	.060	11.28	550
8	1200	165.0	38	2.8	21.9	18.6	0	59	.060	11.66	730
9	1200	187.0	43	2.4	23.4	18.1	0	64	.060	11.79	1175
10	1200	207.0	47	.8	31.8	13.1	0	51	4.530	12.18	1100
11	600	0.0	0	15.5	5.0	26.8	0	40	.030	8.03	56
12	1200	0.0	0	21.3	5.1	42.6	0	632	.030	5.74	12
13	2300	217.0	95	0.0	0.0	12.9	0	735	4.530	11.92	220
14	2300	198.0	87	2.3	56.3	14.5	0	53	1.110	13.73	200
15	2300	180.0	79	3.4	45.8	16.5	0	12	.060	13.00	435
16	2300	163.0	71	4.5	42.4	16.9	0	7	.060	12.59	460
17	2300	108.0	47	9.7	29.7	20.5	0	14	.060	10.33	650
18	2300	53.0	23	14.5	20.4	24.1	0	25	.060	8.82	210
19	2300	39.0	17	15.6	19.5	25.0	0	27	.060	8.52	180
20	2300	16.0	7	17.4	16.0	26.2	0	29	.060	8.03	106
21	2300	5.0	2	18.5	14.6	27.3	0	36	.060	7.75	83
22	600	0.0	0	15.4	4.9	28.1	0	290	.060	7.39	64
23	2300	0.0	0	23.8	5.4	54.1	0	1759	.380	3.38	2

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	3.3	35	6.3	.070	0.0	I	R	R	R
2	0.0	6.5	58	5.7	.060	.1	0.0	5.72	50.4	5.0
3	0.0	5.1	62	8.6	.060	.2	0.0	1.25	15.0	2.1
4	0.0	4.3	66	16.7	.050	.4	0.0	.54	7.8	2.0
5	0.0	4.9	69	25.5	.030	.3	0.0	.42	5.9	2.2
6	0.0	3.0	92	61.8	.060	1.4	0.0	.12	3.9	2.6
7	0.0	5.2	102	153.3	0.000	0.0	0.0	.15	2.9	4.4
8	0.0	5.0	103	205.3	.040	1.5	0.0	.13	2.7	5.4
9	0.0	5.8	109	349.2	0.000	0.0	0.0	.13	2.5	8.2
10	0.0	4.4	7897	315.2	0.000	0.0	0.0	.09	167.0	6.7
11	0.0	1.1	17	5.2	.070	0.0	I	R	R	R
12	0.0	25.1	24	1.6	.120	0.0	I	R	R	R
13	0.0	0.0	0	0.0	.025	2.4	0.0	0.00	0.0	0.0
14	0.0	9.2	3857	114.2	.055	4.8	0.0	.11	44.5	1.3
15	0.0	2.0	193	229.7	.035	2.8	0.0	.02	2.4	2.9
16	0.0	1.0	184	232.2	.060	4.3	0.0	.01	2.6	3.3
17	0.0	1.8	157	279.8	.060	2.8	0.0	.04	3.3	5.9
18	0.0	2.6	126	72.6	0.000	0.0	0.0	.11	5.4	3.1
19	0.0	2.8	125	61.6	.065	1.1	0.0	.16	7.3	3.6
20	0.0	2.6	109	31.6	0.000	0.0	0.0	.37	15.5	4.5
21	0.0	3.1	103	23.4	0.000	0.0	0.0	1.41	46.9	10.7
22	0.0	8.6	36	6.3	.080	0.0	I	R	R	R
23	0.0	109.5	478	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.585	GRAM/BHP HR
	CO	13.898	GRAM/BHP HR
	NO2	2.933	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.733	LB/BHP HR

TABLE C-53. MASS EMISSIONS BY 23 MODE PROCEDURE 08-31-73
ENGINE 3-2 TEST 85 RUN 2 OPTIMIZED MODALLY, ECS

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	10.5	7.4	23.3	0	3	.020	8.82	2
2	1200	5.3	1	19.0	14.3	22.0	0	3	.020	9.44	30
3	1200	17.5	4	18.1	15.9	24.9	0	3	.020	8.22	29
4	1200	40.2	9	16.4	18.8	23.0	0	2	.080	8.82	36
5	1200	52.5	12	15.5	20.6	22.0	0	2	.170	9.12	41
6	1200	103.0	24	11.3	28.4	19.2	0	10	.110	11.04	17
7	1200	158.0	36	5.8	38.5	18.4	0	14	.010	11.79	7
8	1200	172.0	39	4.5	40.7	17.8	0	14	.060	11.79	9
9	1200	193.0	44	2.6	45.0	17.4	0	14	.010	12.18	12
10	1200	208.0	48	1.6	48.5	16.8	0	14	.030	12.59	7
11	600	0.0	0	10.7	7.2	22.7	0	14	.010	9.23	14
12	1200	0.0	0	18.9	8.5	27.0	0	2	.010	7.75	18
13	2300	212.0	93	2.1	54.8	16.3	0	14	.040	13.00	5
14	2300	196.0	86	3.1	52.3	16.7	0	12	.030	12.86	7
15	2300	177.0	78	4.6	49.1	16.7	0	14	.020	12.72	7
16	2300	161.0	71	5.7	46.2	17.1	0	12	.010	12.45	7
17	2300	106.0	46	11.2	33.3	20.4	0	12	.040	10.21	48
18	2300	53.0	23	15.3	24.4	23.4	0	12	.010	8.82	40
19	2300	38.0	17	16.6	21.6	24.9	0	15	.010	8.22	35
20	2300	18.0	8	18.0	18.7	26.1	0	15	.010	7.75	26
21	2300	4.0	2	18.9	16.8	27.7	0	17	.010	7.21	20
22	600	0.0	0	10.4	7.7	24.0	0	20	.010	8.42	15
23	2300	0.0	0	22.3	7.8	30.4	0	12	.010	6.70	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	.1	15	.3	.070	0.0	I	R	R	R
2	0.0	.2	28	6.8	.060	.1	0.0	.19	23.1	5.7
3	0.0	.3	35	8.4	.060	.2	0.0	.07	8.8	2.1
4	0.0	.2	155	11.5	.050	.5	0.0	.02	16.9	1.2
5	0.0	.2	345	13.7	.030	.4	0.0	.01	28.8	1.1
6	0.0	1.2	257	6.5	.060	1.4	0.0	.05	10.9	.3
7	0.0	2.1	30	3.4	0.000	0.0	0.0	.06	.8	.1
8	0.0	2.2	189	4.7	.040	1.6	0.0	.05	4.8	.1
9	0.0	2.3	34	6.7	0.000	0.0	0.0	.05	.8	.2
10	0.0	2.4	106	4.1	0.000	0.0	0.0	.05	2.2	.1
11	0.0	.5	7	1.6	.070	0.0	I	R	R	R
12	0.0	.1	10	3.0	.120	0.0	I	R	R	R
13	0.0	2.7	154	3.2	.025	2.3	0.0	.03	1.7	.0
14	0.0	2.2	112	4.3	.055	4.7	0.0	.03	1.3	.0
15	0.0	2.4	71	4.1	.035	2.7	0.0	.03	.9	.1
16	0.0	2.0	34	3.9	.060	4.2	0.0	.03	.5	.1
17	0.0	1.8	119	23.5	.060	2.8	0.0	.04	2.6	.5
18	0.0	1.5	25	16.6	0.000	0.0	0.0	.06	1.1	.7
19	0.0	1.8	24	13.8	.065	1.1	0.0	.11	1.4	.8
20	0.0	1.6	22	9.4	0.000	0.0	0.0	.21	2.8	1.2
21	0.0	1.8	21	7.0	0.000	0.0	0.0	1.00	12.2	4.0
22	0.0	.8	8	2.1	.080	0.0	I	R	R	R
23	0.0	.6	11	1.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.045	GRAM/BHP HR
	CO	3.283	GRAM/BHP HR
	NO2	.284	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	1.000	LB/BHP HR

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                    TABLE C-54.            VEHICLE EMISSION RESULTS

UNIT NO.  3-IX      TEST NO. 1         DATE 10/11/73                        MFGR. CODE   3                      YR.  1970
VEHICLE MODEL                          ENGINE   3-IX                        CURB WT.     8,930                  GVW  24,000
                                                                            LA-4 Dyno Test Weight  16,000

BAROMETER  29.05 IN.HG.                                                   WET BULB TEMP 54.0 DEG. F
DRY BULB TEMP.  65.0 DEG. F                                                SP. HUMIDITY  74.9 GRAINS/LB
REL. HUMIDITY     42 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                   1                  2
     FINAL WT.,    GRAMS                    -0.00              -0.00
     INITIAL WT., GRAMS                     -0.00              -0.00
     DIFFERENCE    GRAMS                     0.00               0.00

     TOTAL EVAPORATIVE EMISSIONS                                                   0.00 GRAMS

EXHAUST EMISSIONS

                                                                          BLOWER INLET PRESS., G1    6.7 IN. H2O
     BLOWER DIF. PRESS., G2,  12.5 IN. H2O                                BLOWER INLET TEMP.  160 DEG. F

     BAG RESULTS
     BAG NO.                                    1                  2                  3
     BLOWER REVOLUTIONS                     10066              16542               9797
     HC    SAMPLE   METER READING/SCALE    23.9/3              8.7/3             13.4/3
     HC    SAMPLE   PPM                       239                 87                134
     HC    BACKGRD METER READING/SCALE      1.8/3              2.8/3              2.1/3
     HC    BACKGRD PPM                         18                 28                 21
     CO    SAMPLE   METER READING/SCALE    62.1/2             38.6/2       [illegible]
     CO    SAMPLE   PPM                      2275               1270               3917
     CO    BACKGRD METER READING/SCALE       .9/3               .7/3               .9/2
     CO    BACKGRD PPM                         13                 10                 25
     CO2   SAMPLE   METER READING/SCALE    79.6/2             51.5/2             72.9/2
     CO2   SAMPLE   PERCENT                  2.99               1.46               2.19
     CO2   BACKGRD METER READING/SCALE      1.6/2              2.2/2              2.4/2
     CO2   BACKGRD PERCENT                    .09                .05                .06
     NOX   SAMPLE   METER READING/SCALE    18.8/3             11.4/3             22.3/3
     NOX   SAMPLE   PPM                      56.4               34.2               66.9
     NOX   BACKGRD METER READING/SCALE       .1/3               .2/3               .1/3
     NOX   BACKGRD PPM                         .3                 .6                 .3

     HC    CONCENTRATION PPM                  225                 62                117
     CO    CONCENTRATION PPM                 2127               1208               3673
     CO2   CONCENTRATION PCT                 2.91               1.41               2.14
     NOX   CONCENTRATION PPM                 56.2               33.7               66.7
     HC    MASS GRAMS                       18.59               8.47               9.43
     CO    MASS GRAMS                      355.41             331.62             598.23
     CO2   MASS GRAMS                     6364.10            6117.11            5501.64
     NOX   MASS GRAMS                       15.56              15.33              12.97

     WEIGHTED MASS HC        2.91 GRAMS/MILE
     WEIGHTED MASS CO      110.06 GRAMS/MILE
     WEIGHTED MASS CO2    1598.61 GRAMS/MILE
     WEIGHTED MASS NOX       4.30 GRAMS/MILE
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TABLE C-55. VEHICLE EMISSION RESULTS

UNIT NO. 3-IX TEST NO. 2 DATE 10/12/73 MFGR. CODE 3 YR. 1970
VEHICLE MODEL ENGINE 3-IX CURB WT. 8,930 GVW 24,000
LA-4 Dyno Test Weight 16,000

BAROMETER 29.09 IN.HG. WET BULB TEMP 75. DEG. F
DRY BULB TEMP. 88.0 DEG. F SP. HUMIDITY 112.4 GRAINS/LB
REL. HUMIDITY 55 PCT.

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER INLET PRESS., G1 6.6 IN. H2O
BLOWER DIF. PRESS., G2, 12.3 IN. H2O BLOWER INLET TEMP. 165 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	9934	16503	482[illegible]
HC SAMPLE METER READING/SCALE	22.8/3	6.2/3	[illegible]
HC SAMPLE PPM	228	62	108
HC BACKGRD METER READING/SCALE	1.7/3	2.3/3	1.7/3
HC BACKGRD PPM	17	23	17
CO SAMPLE METER READING/SCALE	73.9/2	38.3/2	82.5/2
CO SAMPLE PPM	2872	1258	3355
CO BACKGRD METER READING/SCALE	.3/2	.1/2	.3/2
CO BACKGRD PPM	8	3	8
CO2 SAMPLE METER READING/SCALE	77.7/2	52.3/2	73.6/2
CO2 SAMPLE PERCENT	2.37	1.49	2.22
CO2 BACKGRD METER READING/SCALE	1.7/2	2.0/2	1.2/2
CO2 BACKGRD PERCENT	.04	.05	.03
NOX SAMPLE METER READING/SCALE	21.3/3	9.8/3	19.4/3
NOX SAMPLE PPM	63.9	29.4	58.2
NOX BACKGRD METER READING/SCALE	0.0/3	.3/3	.1/3
NOX BACKGRD PPM	0.0	.9	.3
HC CONCENTRATION PPM	214	42	94
CO CONCENTRATION PPM	2684	1197	3146
CO2 CONCENTRATION PCT	2.34	1.44	2.20
NOX CONCENTRATION PPM	63.9	28.6	58.0
HC MASS GRAMS	17.41	5.63	7.57
CO MASS GRAMS	440.00	326.13	510.03
CO2 MASS GRAMS	6054.53	6199.57	5622.96
NOX MASS GRAMS	20.88	15.53	18.73

WEIGHTED MASS HC 2.32 GRAMS/MILE
WEIGHTED MASS CO 107.47 GRAMS/MILE
WEIGHTED MASS CO2 1601.08 GRAMS/MILE
WEIGHTED MASS NOX 4.69 GRAMS/MILE

TABLE C-56. VEHICLE EMISSION RESULTS

UNIT NO. 3-0 TEST NO. 3 DATE 10/15/73 MFGR. CODE 3 YR. 1970
VEHICLE MODEL ENGINE 3-IX CURB WT. 8,930 GVW 24,000
LA-4 Dyno Test Weight 16,000

BAROMETER 29.42 IN.HG.
DRY BULB TEMP. 77.0 DEG. F
REL. HUMIDITY 71 PCT.
WET BULB TEMP 70.0 DEG. F
SP. HUMIDITY 100.1 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 13.5 IN. H2O
BLOWER INLET PRESS., G1 7.6 IN. H2O
BLOWER INLET TEMP. 130 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	9485	16935	9814
HC SAMPLE METER READING/SCALE	11.2/4	39.8/3	73.3/3
HC SAMPLE PPM	1120	398	734
HC BACKGRD METER READING/SCALE	.1/3	2.1/3	2.4/3
HC BACKGRD PPM	1	21	24
CO SAMPLE METER READING/SCALE	63.3/1	76.5/2	68.6/1
CO SAMPLE PPM	7520	3014	8917
CO BACKGRD METER READING/SCALE	.5/2	.6/2	1.2/2
CO BACKGRD PPM	14	17	34
CO2 SAMPLE METER READING/SCALE	59.9/2	39.6/2	54.6/2
CO2 SAMPLE PERCENT	1.74	1.09	1.56
CO2 BACKGRD METER READING/SCALE	1.9/2	1.9/2	2.5/2
CO2 BACKGRD PERCENT	.05	.05	.06
NOX SAMPLE METER READING/SCALE	24.8/3	14.9/3	21.0/3
NOX SAMPLE PPM	74.4	44.7	63.0
NOX BACKGRD METER READING/SCALE	.2/3	0.0/3	0.0/3
NOX BACKGRD PPM	.6	0.0	0.0
HC CONCENTRATION PPM	1119	379	718
CO CONCENTRATION PPM	7085	2867	8418
CO2 CONCENTRATION PCT	1.70	1.04	1.51
NOX CONCENTRATION PPM	73.9	44.7	63.0
HC MASS GRAMS	96.89	53.87	61.31
CO MASS GRAMS	1238.40	822.26	1450.52
CO2 MASS GRAMS	4689.60	4729.26	4107.47
NOX MASS GRAMS	24.06	23.88	20.22

WEIGHTED MASS HC 17.40 GRAMS/MILE
WEIGHTED MASS CO 290.88 GRAMS/MILE
WEIGHTED MASS CO2 1211.61 GRAMS/MILE
WEIGHTED MASS NOX 6.10 GRAMS/MILE

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                  TABLE C-67.            VEHICLE EMISSION RESULTS

UNIT NO.  3-D         TEST NO. 4          DATE 10/16/73                   MFGR. CODE    3                    YR.  1970
VEHICLE MODEL                             ENGINE   3-IX                   CURB WT.      8,930                GVW  24,000
                                                                          LA-4 Dyno Test Weight  16,000

BAROMETER  29.30 IN.HG.                                                  WET BULB TEMP 67.0 DEG. F
DRY BULB TEMP.  76.0 DEG. F                                               SP. HUMIDITY  96.0 GRAINS/LB
REL. HUMIDITY      63 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                         1              2
     FINAL WT.,   GRAMS                           -0.00          -0.00
     INITIAL WT., GRAMS                           -0.00          -0.00
     DIFFERENCE   GRAMS                            0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                          0.00 GRAMS

EXHAUST EMISSIONS

                                                                          BLOWER INLET PRESS., G1   7.5 IN. H2O
     BLOWER DIF. PRESS., G2,  13.5 IN. H20                                BLOWER INLET TEMP.  115 DEG. F

     BAG RESULTS
     BAG NO.                                           1              2              3
     BLOWER REVOLUTIONS                             9995          16508           9685
     HC    SAMPLE  METER READING/SCALE            99.0/3         35.5/3         62.4/3
     HC    SAMPLE  PPM                               980            355            684
     HC    BACKGRD METER READING/SCALE             1.7/3          2.8/3          2.6/3
     HC    BACKGRD PPM                                17             28             26
     CO    SAMPLE  METER READING/SCALE            59.4/1         69.1/2         60.2/1
     CO    SAMPLE  PPM                              6536           2621           6803
     CO    BACKGRD METER READING/SCALE              .3/2          2.3/2          2.2/2
     CO    BACKGRD PPM                                 8             65             62
     CO2   SAMPLE  METER READING/SCALE            55.5/2         35.2/2         52.6/2
     CO2   SAMPLE  PERCENT                          1.59            .95           1.49
     CO2   BACKGRD METER READING/SCALE             3.9/2          3.0/2          3.1/2
     CO2   BACKGRD PERCENT                           .10            .08            .08
     NOX   SAMPLE  METER READING/SCALE            22.3/3         14.3/3         26.8/3
     NOX   SAMPLE  PPM                              66.9           42.9           80.4
     NOX   BACKGRD METER READING/SCALE              .5/3           .3/3           .2/3
     NOX   BACKGRD PPM                               1.5             .9             .6

     HC    CONCENTRATION PPM                         966            330            662
     CO    CONCENTRATION PPM                        6292           2462           6424
     CO2   CONCENTRATION PCT                        1.51            .89           1.47
     NOX   CONCENTRATION PPM                        65.7           42.1         . 79.4
     HC    MASS GRAMS                              85.81          48.36          57.01
     CO    MASS GRAMS                            1128.49         729.37        1114.43
     CO2   MASS GRAMS                            4274.87        4147.95        3925.36
     NOX   MASS GRAMS                              20.40          21.60          24.05

     WEIGHTED MASS HC      15.70 GRAMS/MILE
     WEIGHTED MASS CO     246.78 GRAMS/MILE
     WEIGHTED MASS CO2  1096.48 GRAMS/MILE
     WEIGHTED MASS NOX     5.88 GRAMS/MILE
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APPENDIX D

TASK 4 - ENGINE 4

MASS EMISSION RESULTS BY:
NINE-MODE FTP
NINE-MODE EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY
1975 LIGHT DUTY FTP

TABLE D-1. NINE-MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 4

				Composite Emissions, Grams/Bhp Hr					Cycle
				HC		CO	NO_2		BSFC
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp hr
31	1	6-15	4-00	7.22	9.00	63.9	8.95	7.86	0.709
31	2	6-15	4-00	5.68	8.14	61.6	8.54	8.09	0.709
31	3	6-15	4-00	5.99	8.59	64.0	8.96	8.58	0.709
		Average		6.3	8.6	63.2	8.8	8.2	0.709
42	1	6-27	4-0	4.17	4.99	55.5	6.64	5.95	0.794
42	2	6-27	4-0	4.26	5.79	55.8	6.11	5.56	0.794
42	3	6-27	4-0	4.60	5.87	57.7	6.32	5.59	0.794
		Average		4.3	5.6	56.3	6.4	5.7	0.794
39	1	6-25	4-1	1.05	0.68	7.3	5.54	4.99	0.845
39	2	6-25	4-1	0.96	0.61	5.8	5.69	5.32	0.845
39	3	6-25	4-1	1.02	0.66	5.5	5.53	5.31	0.845
		Average		1.0	0.7	6.2	5.6	5.2	0.845

* Engine 4-00 - 1972 Standard Configuration
Engine 4-0 - 1973 California EGR (5% Pintle)
Engine 4-1 - EGR (10% Pintle), Air Injection, and Oxidation Catalyst

TABLE D-2. NINE-MODE EPA COMPOSITE EMISSIONS SUMMARY FOR ENGINE 4

				Composite Emissions, Grams/Bhp Hr					Cycle
				HC		CO	NO_2		BSFC
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp hr
33	1	6-18	4-00	6.05	6.74	67.5	8.94	8.81	0.677
33	2	6-18	4-00	5.48	8.38	62.1	8.77	8.16	0.677
33	3	6-18	4-00	5.64	8.50	62.0	8.56	8.27	0.677
		Average		5.7	7.9	63.9	8.8	8.4	0.677
43	1	6-28	4-0	3.65	5.54	55.4	6.07	5.72	0.729
43	2	6-28	4-0	3.28	5.15	56.3	6.52	6.04	0.729
43	3	6-28	4-0	3.83	5.08	56.6	5.70	5.40	0.729
		Average		3.6	5.3	56.1	6.1	5.7	0.729
41	1	6-26	4-1	1.00	0.54	5.3	6.32	5.97	0.719
41	2	6-26	4-1	1.14	0.53	2.9	6.25	5.98	0.719
41	3	6-26	4-1	1.10	0.58	2.6	6.04	5.84	0.719
		Average		1.1	0.5	3.6	6.2	5.9	0.719

* Engine 4-00 - 1972 Standard Configuration
Engine 4-0 - 1973 California, EGR (5% Pintle)
Engine 4-1 - EGR (10% Pintle), Air Injection and Oxidation Catalyst

TABLE D-3. TWENTY-THREE-MODE COMPOSITE EMISSIONS SUMMARY FOR ENGINE 4

				Composite Emissions, Grams/Bhp Hr					
				HC		CO	NO_2		
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC lbs/Bhp hr
34	1	6-18	4-00	---	8.93	89.7	---	6.55	0.691
34	2	6-18	4-00	---	8.87	89.1	---	6.73	0.697
34	3	6-18	4-00	---	7.50	96.1	---	5.06	0.696
		Average			8.4	91.6		6.1	0.695
44	1	6-28	4-0	---	11.80	99.1	---	4.95	0.701
44	2	6-28	4-0	---	11.57	93.3	---	4.98	0.701
44	3	6-28	4-0	---	11.28	95.3	---	4.33	0.702
		Average			11.6	95.9		4.8	0.701
40	1	6-26	4-1	---	0.97	16.50	---	4.29	0.752
40	2	6-26	4-1	---	0.87	16.08	---	4.36	0.746
40	3	6-26	4-1	---	0.92	12.66	---	4.81	0.754
		Average			0.9	15.1		4.5	0.751

* Engine 4-00 - 1972 Standard Configuration
Engine 4-0 - 1973 California EGR (5% Pintle)
Engine 4-1 - EGR (10% Pintle), Air Injection and Oxidation Catalyst

TABLE D-4. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 4-00 TEST 31 RUN-1 1972 STANDARD ENGINE 06-15-73 K =1.071 HUM =102.3 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	317	1.510	11.86	162	13.712	2767	69	615	11	.232	16.0	143	2.5	0	18.0
2 16 HG	303	1.220	13.12	690	14.667	9253	206	1555	145	.077	15.9	120	11.1	27	16.0
3 10 HG	292	1.050	13.33	1843	14.695	13835	297	1997	576	.147	43.6	294	84.7	57	10.0
4 16 HG	261	1.440	13.06	785	14.782	9253	176	1821	163	.077	13.6	140	12.6	27	16.0
5 19 HG	240	1.290	13.19	376	14.739	7076	124	1251	60	.057	7.1	71	3.4	10	19.0
6 16 HG	246	1.330	13.12	765	14.716	9253	167	1689	160	.077	12.9	130	12.3	27	16.0
7 3 HG	228	1.660	12.85	1344	14.766	19233	321	4370	582	.113	36.3	494	65.7	80	3.0
8 16 HG	230	1.440	13.17	795	14.858	9253	155	1811	164	.077	11.9	139	12.7	27	16.0
9 C.T.	2718	2.260	7.45	159	12.695	2404	558	868	10	.143	79.8	124	1.4	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											9.0	63	7.9		
1 IDLE	317	1.510	11.86	162	13.712	2767	69	615	11	.232	16.0	143	2.5	0	18.0
2 16 HG	218	1.310	13.11	796	14.655	9253	149	1671	167	.077	11.5	129	12.9	27	16.0
3 10 HG	218	.850	13.35	1974	14.435	13835	226	1646	628	.147	33.2	242	92.3	57	10.0
4 16 HG	191	1.300	13.06	864	14.566	9253	131	1666	182	.077	10.1	128	14.0	27	16.0
5 19 HG	174	1.200	13.17	415	14.558	7076	91	1178	67	.057	5.2	67	3.8	10	19.0
6 16 HG	181	1.140	13.09	858	14.425	9253	125	1477	183	.077	9.7	114	14.1	27	16.0
7 3 HG	167	1.440	12.85	1423	14.470	19233	240	3866	628	.113	27.1	437	71.0	80	3.0
8 16 HG	170	1.160	13.17	877	14.514	9253	117	1494	186	.077	9.0	115	14.3	27	16.0
9 C.T.	2683	2.230	7.72	181	12.848	2404	542	843	11	.143	77.5	121	1.6	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											7.6	57	8.6		
1 IDLE	187	1.910	11.94	249	14.052	2767	40	760	16	.232	9.2	176	3.8	0	18.0
2 16 HG	181	1.350	13.05	798	14.595	9253	124	1729	168	.077	9.5	133	12.9	27	16.0
3 10 HG	189	1.080	13.26	1850	14.544	13835	194	2075	584	.147	28.5	305	85.9	57	10.0
4 16 HG	166	1.480	13.09	887	14.749	9253	112	1876	185	.077	8.7	144	14.2	27	16.0
5 19 HG	149	1.390	13.13	430	14.681	7076	78	1353	69	.057	4.4	77	3.9	10	19.0
6 16 HG	160	1.390	13.05	846	14.613	9253	109	1778	178	.077	8.4	137	13.7	27	16.0
7 3 HG	145	1.700	12.89	1399	14.747	19233	204	4474	606	.113	23.1	506	68.5	80	3.0
8 16 HG	151	1.490	13.11	891	14.763	9253	102	1886	185	.077	7.9	145	14.3	27	16.0
9 C.T.	2705	2.210	7.66	202	12.791	2404	549	839	13	.143	78.5	120	1.8	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											6.8	66	8.3		
1 IDLE	187	1.910	11.94	249	14.052	2767	40	760	16	.232	9.2	176	3.8	0	18.0
2 16 HG	161	1.350	13.08	829	14.609	9253	110	1728	174	.077	8.5	133	13.4	27	16.0
3 10 HG	171	1.040	13.30	1858	14.525	13835	176	2001	588	.147	25.9	294	86.4	57	10.0
4 16 HG	143	1.470	13.08	845	14.704	9253	97	1869	177	.077	7.5	144	13.6	27	16.0
5 19 HG	129	1.470	13.11	436	14.719	7076	67	1427	70	.057	3.8	81	4.0	10	19.0
6 16 HG	141	1.460	13.06	843	14.672	9253	96	1860	177	.077	7.4	143	13.6	27	16.0
7 3 HG	132	1.600	12.92	1496	14.663	19233	187	4239	651	.113	21.1	479	73.6	80	3.0
8 16 HG	140	1.560	13.04	850	14.751	9253	95	1977	177	.077	7.3	152	13.6	27	16.0
9 C.T.	2753	2.230	7.58	211	12.783	2404	559	847	13	.143	80.0	121	1.9	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											6.5	66	8.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----											8.3	60	8.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----											6.6	66	8.4		

FOUR CYCLE COMPOSITE =

HC- NDIR 0.35(8.3) + 0.65(6.6) = 7.222 GM/BHP HR
CO- NDIR 0.35(59.9) + 0.65(66.0) = 63.881 GM/BHP HR
NO2-NDIR 0.35(8.2) + 0.65(8.4) = 8.360 GM/BHP HR
CORRECTED NO2 = 8.951 GM/BHP HR
BSFC = .709 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	2270	1.510	11.86	100	13.597	2767	46	621	7	.232	10.7	144	1.6	0	18.0
2 16 HG	2322	1.220	13.12	638	14.572	9253	147	1565	134	.077	11.4	120	10.4	27	16.0
3 10 HG	2663	1.050	13.33	1763	14.646	13835	252	2004	553	.147	37.0	295	81.3	57	10.0
4 16 HG	2291	1.440	13.06	700	14.729	9253	144	1827	146	.077	11.1	141	11.2	27	16.0
5 19 HG	1928	1.290	13.19	300	14.673	7076	93	1257	48	.057	5.3	72	2.7	10	19.0
6 16 HG	2233	1.330	13.12	675	14.673	9253	141	1694	141	.077	10.8	130	10.9	27	16.0
7 3 HG	1894	1.660	12.85	1238	14.699	19233	248	4387	538	.113	28.0	496	60.8	80	3.0
8 16 HG	2350	1.440	13.17	700	14.845	9253	146	1813	145	.077	11.3	140	11.2	27	16.0
9 C.T.	47080	2.260	7.45	51	14.418	2404	785	761	3	.143	112.3	109	.4	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											9.1	63	7.2		
1 IDLE	2270	1.510	11.86	100	13.597	2767	46	621	7	.232	10.7	144	1.6	0	18.0
2 16 HG	2459	1.310	13.11	687	14.666	9253	155	1670	144	.077	11.9	129	11.1	27	16.0
3 10 HG	2568	.850	13.35	1850	14.457	13835	246	1643	588	.147	36.1	242	86.4	57	10.0
4 16 HG	2118	1.300	13.06	750	14.572	9253	135	1667	158	.077	10.4	128	12.2	27	16.0
5 19 HG	1779	1.200	13.17	313	14.548	7076	87	1179	51	.057	4.9	67	2.9	10	19.0
6 16 HG	2060	1.140	13.09	737	14.436	9253	132	1476	157	.077	10.2	114	12.1	27	16.0
7 3 HG	1669	1.440	12.85	1300	14.456	19233	221	3870	574	.113	25.0	437	64.9	80	3.0
8 16 HG	2039	1.160	13.17	737	14.534	9253	130	1492	156	.077	10.0	115	12.0	27	16.0
9 C.T.	44961	2.230	7.72	42	14.446	2404	748	750	2	.143	107.0	107	.3	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											8.6	56	7.7		
1 IDLE	3125	1.910	11.94	113	14.162	2767	61	754	7	.232	14.2	175	1.7	0	18.0
2 16 HG	2493	1.350	13.05	638	14.649	9253	157	1722	134	.077	12.1	133	10.3	27	16.0
3 10 HG	2684	1.080	13.26	1700	14.608	13835	254	2066	535	.147	37.4	304	78.6	57	10.0
4 16 HG	2336	1.480	13.09	725	14.803	9253	145	1869	150	.077	11.2	144	11.6	27	16.0
5 19 HG	1951	1.390	13.13	300	14.715	7076	94	1350	48	.057	5.3	77	2.7	10	19.0
6 16 HG	2290	1.390	13.05	700	14.669	9253	144	1771	147	.077	11.1	136	11.3	27	16.0
7 3 HG	1895	1.700	12.89	1250	14.780	19233	247	4469	540	.113	27.9	505	61.0	80	3.0
8 16 HG	2270	1.490	13.11	725	14.827	9253	142	1878	150	.077	10.9	145	11.6	27	16.0
9 C.T.	45398	2.210	7.66	45	14.410	2404	757	745	2	.143	108.3	107	.4	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											9.1	66	7.2		
1 IDLE	3125	1.910	11.94	113	14.162	2767	61	754	7	.232	14.2	175	1.7	0	18.0
2 16 HG	2494	1.350	13.08	650	14.679	9253	157	1719	136	.077	12.1	132	10.5	27	16.0
3 10 HG	2718	1.040	13.30	1700	14.612	13835	257	1989	534	.147	37.8	292	78.6	57	10.0
4 16 HG	2212	1.470	13.08	687	14.771	9253	139	1860	143	.077	10.7	143	11.0	27	16.0
5 19 HG	1929	1.470	13.11	300	14.773	7076	92	1422	48	.057	5.3	81	2.7	10	19.0
6 16 HG	2235	1.460	13.06	675	14.743	9253	140	1851	141	.077	10.8	143	10.8	27	16.0
7 3 HG	1928	1.600	12.92	1325	14.713	19233	252	4225	575	.113	28.5	477	65.0	80	3.0
8 16 HG	2293	1.560	13.04	713	14.829	9253	143	1966	148	.077	11.0	151	11.4	27	16.0
9 C.T.	45375	2.230	7.58	44	14.347	2404	760	755	2	.143	108.7	108	.4	0	23.9
----CYCLE COMPOSITE IN GM/BHP HR----											9.1	65	7.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----											8.8	60	7.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----											9.1	65	7.3		

FOUR CYCLE COMPOSITE =

HC- FID 0.35(8.8) + 0.65(9.1) = 8.996 GM/BHP HR
CO- NDIR 0.35(59.5) + 0.65(65.2) = 63.234 GM/BHP HR
NO2-CL 0.35(7.5) + 0.65(7.3) = 7.336 GM/BHP HR
CORRECTED NO2 = 7.855 GM/BHP HR
BSFC = .709 LB/BHP HR

TABLE D-5. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE [illegible]  TEST 31  RUN-2  1972 STANDARD ENGINE   06-15-73      * 31.083     HUM =104.2  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR           MAN.
MODE         HC     CO    CO2     NO    CARBON   CONS.      HC      CO     NO2   FACT.    HC       CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE      165  1.570  11.68    153    13.928    2767      37     653     10   .232     8.5     152    2.4     0    18.0
2 16 MG     154  1.330  12.84    684    14.335    9253     107    1734    147   .077     8.2     134   11.3    27    16.0
3 10 MG     166  1.010  13.04   1848    14.279   13835     174    1977    599   .147    25.5     291   87.9    57    10.0
4 16 MG     137  1.480  12.86    717    14.488    9253      94    1909    152   .077     7.3     147   11.7    27    16.0
5 19 MG     112  1.380  13.10    344    14.601    7076      59    1351     56   .057     3.3      77    3.2    10    19.0
6 16 MG     128  1.330  13.06    722    14.528    9253      88    1711    153   .077     6.8     132   11.8    27    16.0
7  3 MG     115  1.610  12.86   1327    14.594   19233     169    4286    581   .113    18.5     484   65.6    80     3.0
8 16 MG     126  1.340  13.10    782    14.576    9253      86    1718    165   .077     6.7     132   12.7    27    16.0
9 C.T.     2363  1.990   7.78    112    12.322    2404     498     784      7   .143    71.2     112    1.0     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.9      63    7.9
1 IDLE      165  1.57   11.68    153    13.928    2767      37     653     10   .232     8.5     152    2.4     0    18.0
2 16 MG     135  1.260  13.05    672    14.456    9253      93    1629    143   .077     7.2     125   11.0    27    16.0
3 10 MG     148  1.020  13.28   1834    14.460   13835     153    1971    584   .147    22.5     290   85.9    57    10.0
4 16 MG     124  1.360  13.04    742    14.584    9253      85    1743    156   .077     6.5     134   12.0    27    16.0
5 19 MG     113  1.300  13.07    361    14.492    7076      60    1282     59   .057     3.4      73    3.3    10    19.0
6 16 MG     120  1.300  13.05    756    14.480    9253      83    1678    160   .077     6.4     129   12.4    27    16.0
7  3 MG     111  1.570  12.88   1326    14.570   19233     158    4186    581   .113    17.9     473   65.7    80     3.0
8 16 MG     116  1.340  13.07    742    14.535    9253      80    1723    157   .077     6.1     133   12.1    27    16.0
9 C.T.     2443  2.030   7.71    107    12.378    2404     512     796      7   .143    73.3     114    1.0     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.8      62    7.8
1 IDLE      161  1.770  11.88    166    13.824    2767      35     716     11   .232     8.1     166    2.6     0    18.0
2 16 MG     133  1.300  13.07    701    14.514    9253      92    1674    148   .077     7.1     129   11.4    27    16.0
3 10 MG     143   .970  13.32   1787    14.444   13835     148    1877    568   .147    21.7     276   83.5    57    10.0
4 16 MG     119  1.330  13.07    745    14.529    9253      82    1711    158   .077     6.3     132   12.1    27    16.0
5 19 MG     105  1.200  13.16    360    14.473    7076      55    1185     58   .057     3.2      68    3.3    10    19.0
6 16 MG     118  1.360  13.07    764    14.557    9253      81    1746    162   .077     6.2     134   12.5    27    16.0
7  3 MG     106  1.640  12.90   1337    14.634   19233     150    4301    583   .113    17.0     486   65.9    80     3.0
8 16 MG     113  1.370  13.11    781    14.602    9253      77    1754    164   .077     6.0     135   12.7    27    16.0
9 C.T.     2406  2.040   7.64    108    12.328    2404     507     804      7   .143    72.5     115    1.0     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.6      62    7.8
1 IDLE      161  1.770  11.88    166    13.824    2767      35     716     11   .232     8.1     166    2.6     0    18.0
2 16 MG     128  1.240  13.07    701    14.448    9253      89    1604    149   .077     6.8     124   11.5    27    16.0
3 10 MG     140   .930  13.36   1833    14.491   13835     145    1800    583   .147    21.3     265   85.7    57    10.0
4 16 MG     115  1.320  13.10    754    14.544    9253      79    1696    159   .077     6.1     131   12.3    27    16.0
5 19 MG      99  1.260  13.18    366    14.547    7076      52    1238     59   .057     3.0      71    3.4    10    19.0
6 16 MG     113  1.300  13.08    729    14.502    9253      78    1676    154   .077     6.0     129   11.9    27    16.0
7  3 MG     105  1.580  12.91   1396    14.593   19233     150    4060    613   .113    16.9     459   69.3    80     3.0
8 16 MG     111  1.260  13.21    778    14.590    9253      76    1619    164   .077     5.9     124   12.6    27    16.0
9 C.T.     2358  1.890   7.86    110    12.297    2404     498     746      7   .143    71.2     107    1.0     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.5      60    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     5.9      62    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     5.6      61    7.9
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     5.9) + 0.65(     5.6) =    5.677   GM/BHP HR
                                    CO- NDIR 0.35(    62.5) + 0.65(    61.2) =   61.627   GM/BHP HR
                                    NO2-NDIR 0.35(     7.9) + 0.65(     7.9) =    7.885   GM/BHP HR
                                                           CORRECTED NO2 =    8.543   GM/BHP HR
                                                                    BSFC =     .709   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR           MAN.
MODE       HC-FID   CO    CO2   NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL  HP    VAC.
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1 IDLE     2155  1.570  11.68     88    13.466    2767      44     652      6   .232    10.3     151    1.4     0    18.0
2 16 MG    2036  1.330  12.84    613    14.374    9253     131    1729    131   .077    10.1     133   10.1    27    16.0
3 10 MG    2453  1.010  13.04   1775    14.345   13835     237    1968    568   .147    34.8     289   83.5    57    10.0
4 16 MG    2034  1.480  12.86    650    14.544    9253     130    1902    137   .077    10.0     146   10.6    27    16.0
5 19 MG    1667  1.380  13.10    300    14.647    7076      81    1347     48   .057     4.6      77    2.7    10    19.0
6 16 MG    1983  1.330  13.06    663    14.588    9253     126    1704    140   .077     9.7     131   10.8    27    16.0
7  3 MG    1610  1.610  12.86   1250    14.631   19233     212    4275    546   .113    23.9     483   61.6    80     3.0
8 16 MG    1984  1.340  13.10    725    14.638    9253     125    1711    152   .077     9.7     132   11.7    27    16.0
9 C.T.    35323  1.990   7.78     49    13.302    2404     638     726      3   .143    91.3     104     .4     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     7.8      63    7.3
1 IDLE     2155  1.570  11.68     88    13.466    2767      44     652      6   .232    10.3     151    1.4     0    18.0
2 16 MG    2151  1.260  13.05    638    14.525    9253     137    1621    135   .077    10.6     125   10.4    27    16.0
3 10 MG    2344  1.020  13.28   1775    14.534   13835     223    1961    561   .147    32.8     288   82.5    57    10.0
4 16 MG    2007  1.360  13.04    700    14.651    9253     127    1735    147   .077     9.8     134   11.3    27    16.0
5 19 MG    1756  1.300  13.07    313    14.596    7076      85    1277     51   .057     4.9      73    2.9    10    19.0
6 16 MG    1942  1.300  13.05    700    14.548    9253     126    1670    148   .077     9.7     129   11.4    27    16.0
7  3 MG    1700  1.570  12.88   1275    14.620   19233     224    4172    557   .113    25.3     471   62.9    80     3.0
8 16 MG    1927  1.340  13.07    688    14.603    9253     122    1718    145   .077     9.4     132   11.1    27    16.0
9 C.T.    39391  2.030   7.71     43    13.679    2404     692     721      3   .143    99.0     103     .4     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     8.1      61    7.4
1 IDLE     3091  1.770  11.88    113    13.954    2767      60     709      7   .232    14.0     164    1.7     0    18.0
2 16 MG    2266  1.300  13.07    638    14.597    9253     144    1665    134   .077    11.1     128   10.3    27    16.0
3 10 MG    2457   .970  13.32   1750    14.536   13835     234    1865    553   .147    34.4     274   81.3    57    10.0
4 16 MG    2062  1.330  13.07    700    14.606    9253     131    1702    147   .077    10.1     131   11.3    27    16.0
5 19 MG    1766  1.200  13.16    325    14.536    7076      85    1180     53   .057     4.9      67    3.0    10    19.0
6 16 MG    2131  1.360  13.07    785    14.643    9253     135    1736    152   .077    10.4     134   11.7    27    16.0
7  3 MG    1758  1.620  12.90   1288    14.696   19233     230    4283    560   .113    26.0     484   63.2    80     3.0
8 16 MG    1984  1.370  13.11    760    14.678    9253     125    1746    157   .077     9.6     134   12.1    27    16.0
9 C.T.    39565  2.040   7.64     49    13.686    2404     695     724      3   .143    99.4     104     .4     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     8.4      62    7.4
1 IDLE     3091  1.770  11.88    113    13.954    2767      60     709      7   .232    14.0     164    1.7     0    18.0
2 16 MG    2231  1.240  13.07    650    14.533    9253     142    1595    137   .077    10.9     123   10.6    27    16.0
3 10 MG    2457   .930  13.36   1775    14.536   13835     234    1788    561   .147    34.4     263   82.5    57    10.0
4 16 MG    2040  1.320  13.10    700    14.624    9253     129    1687    147   .077     9.9     130   11.3    27    16.0
5 19 MG    1700  1.260  13.18    325    14.610    7076      82    1233     52   .057     4.7      70    3.0    10    19.0
6 16 MG    1944  1.300  13.08    675    14.575    9253     124    1667    142   .077     9.5     128   11.0    27    16.0
7  3 MG    1700  1.520  12.91   1375    14.600   19233     224    4045    601   .113    25.3     457   68.0    80     3.0
8 16 MG    1950  1.260  13.21    737    14.665    9253     123    1606    154   .077     9.5     124   11.9    27    16.0
9 C.T.    17647  1.890   7.86     52    13.535    2404     672     678      3   .143    96.1      97     .4     0    23.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.2      59    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     7.9      62    7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     8.3      60    7.5
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     7.9) + 0.65(     8.3) =    8.139   GM/BHP HR
                                    CO- NDIR 0.35(    61.9) + 0.65(    60.5) =   60.956   GM/BHP HR
                                    NO2-CL   0.35(     7.4) + 0.65(     7.5) =    7.469   GM/BHP HR
                                                           CORRECTED NO2 =    8.093   GM/BHP HR
                                                                    BSFC =     .709   LB/BHP HR
```

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                    TABLE D-6. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-00  TEST 31  RUN-3  1972 STANDARD ENGINE   06-15-73       K =1.083      HUM =109.2  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE          HC      CO     CO2     NO   CARBON   CONS.      HC      CO     NO2    FACT.    HC      CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        146   1.500   11.57   141   13.228   2767       33     634     10    .232     7.7    147    2.3     0    18.0
2 16 MG       130   1.280   12.81   675   14.230   9253       91    1681    146    .077     7.0    129   11.2    27    16.0
3 10 MG       142    .890   13.13  1910   14.173  13835      150    1755    587    .147    22.0    258   86.2    57    10.0
4 16 MG       120   1.360   12.82   753   14.310   9253       84    1776    162    .077     6.5    137   12.4    27    16.0
5 19 MG       103   1.320   12.88   359   14.311   7076       55    1318     59    .057     3.1     75    3.4    10    19.0
6 16 MG       116   1.270   12.85   758   14.245   9253       81    1666    163    .077     6.3    128   12.6    27    16.0
7  3 MG       108   1.610   12.64  1351   14.367  19233      156    4354    600    .113    17.6    492   67.8    80     3.0
8 16 MG       113   1.350   12.87   786   14.342   9253       79    1759    168    .077     6.1    135   13.0    27    16.0
9 C.T.       2780   2.010    7.37   108   12.382   2409      583     788      7    .143    83.4    113    1.0     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      6.1     61    8.0
1 IDLE        146   1.500   11.57   141   13.228   2767       33     634     10    .232     7.7    147    2.3     0    18.0
2 16 MG       132   1.350   12.75   713   14.243   9253       93    1772    154    .077     7.1    136   11.8    27    16.0
3 10 MG       145    .980   13.08  1883   14.217  13835      152    1926    608    .147    22.4    283   89.4    57    10.0
4 16 MG       119   1.530   12.75   776   14.409   9253       83    1985    165    .077     6.4    153   12.7    27    16.0
5 19 MG       103   1.380   12.87   372   14.361   7076       55    1373     61    .057     3.1     78    3.5    10    19.0
6 16 MG       113   1.300   12.80   795   14.222   9253       79    1709    172    .077     6.1    132   13.2    27    16.0
7  3 MG       106   1.630   12.59  1406   14.334  19233      159    4418    626    .113    17.9    499   70.8    80     3.0
8 16 MG       110   1.470   12.85   791   14.439   9253       76    1903    168    .077     5.9    147   13.0    27    16.0
9 C.T.       2763   2.090    7.40   107   12.479   2409      575     814      7    .143    82.2    116    1.0     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      6.0     64    8.3
1 IDLE        170   1.940   11.83   150   13.954   2767       36     777     10    .232     8.4    180    2.3     0    18.0
2 16 MG       135   1.340   12.75   764   14.236   9253       95    1759    165    .077     7.3    135   12.7    27    16.0
3 10 MG       147   1.010   13.06  1911   14.229  13835      154    1984    617    .147    22.7    292   90.7    57    10.0
4 16 MG       120   1.420   12.76   762   14.310   9253       84    1855    164    .077     6.5    143   12.6    27    16.0
5 19 MG        99   1.400   12.90   384   14.407   7076       53    1389     63    .057     3.0     79    3.6    10    19.0
6 16 MG       116   1.320   12.81   822   14.255   9253       81    1731    177    .077     6.3    133   13.6    27    16.0
7  3 MG       105   1.590   12.68  1388   14.383  19233      152    4313    619    .113    17.2    487   69.9    80     3.0
8 16 MG       113   1.440   12.83   786   14.392   9253       78    1870    168    .077     6.0    144   12.9    27    16.0
9 C.T.       2670   1.960    7.61   100   12.454   2409      557     764      6    .143    79.6    109     .9     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      6.0     65    8.3
1 IDLE        170   1.940   11.83   150   13.954   2767       36     777     10    .232     8.4    180    2.3     0    18.0
2 16 MG       131   1.360   12.81   752   14.311   9253       91    1776    161    .077     7.0    137   12.4    27    16.0
3 10 MG       143    .990   13.12  1878   14.264  13835      150    1848    607    .147    22.1    272   89.2    57    10.0
4 16 MG       115   1.440   12.76   751   14.324   9253       80    1879    161    .077     6.2    145   12.4    27    16.0
5 19 MG       101   1.270   12.91   348   14.289   7076       54    1270     57    .057     3.1     72    3.3    10    19.0
6 16 MG       116   1.260   12.80   835   14.185   9253       82    1660    181    .077     6.3    128   13.9    27    16.0
7  3 MG       105   1.620   12.66  1429   14.393  19233      152    4373    634    .113    17.1    494   71.6    80     3.0
8 16 MG       112   1.500   12.83   788   14.451   9253       77    1940    168    .077     6.0    149   12.9    27    16.0
9 C.T.       2698   2.010    7.60   107   12.524   2409      559     779      7    .143    80.0    111    1.0     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      5.9     64    8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------      6.0     63    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------      6.0     65    8.3
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     6.0) + 0.65(     6.0) =    5.991   GM/BHP HR
                                       CO- NDIR 0.35(    62.9) + 0.65(    64.5) =   63.942   GM/BHP HR
                                       NO2-NDIR 0.35(     8.1) + 0.65(     8.3) =    8.268   GM/BHP HR
                                                              CORRECTED NO2 =    8.954   GM/BHP HR
                                                                       BSFC =     .709   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE        HC-FID    CO     CO2   NO-CL  CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       2018   1.500   11.57    88   13.272   2767       42     632      6    .232     9.8    147    1.4     0    18.0
2 16 MG      1922   1.280   12.81   613   14.282   9253      124    1675    132    .077     9.6    129   10.2    27    16.0
3 10 MG      2282    .890   13.13  1800   14.248  13835      222    1746    580    .147    32.6    257   85.3    57    10.0
4 16 MG      1923   1.360   12.82   688   14.372   9253      124    1769    147    .077     9.5    136   11.3    27    16.0
5 19 MG      1618   1.320   12.88   325   14.362   7076       80    1314     53    .057     4.5     75    3.0    10    19.0
6 16 MG      1866   1.270   12.85   713   14.307   9253      121    1659    153    .077     9.3    128   11.8    27    16.0
7  3 MG      1641   1.610   12.64  1325   14.414  19233      219    4339    587    .113    24.7    490   66.3    80     3.0
8 16 MG      1901   1.350   12.87   738   14.410   9253      122    1751    157    .077     9.4    135   12.1    27    16.0
9 C.T.      37436   2.010    7.37    47   13.124   2409      686     744      3    .143    98.1    106     .4     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      7.9     61    7.7
1 IDLE       2018   1.500   11.57    88   13.272   2767       42     632      6    .232     9.8    147    1.4     0    18.0
2 16 MG      2148   1.350   12.75   638   14.315   9253      139    1763    137    .077    10.7    136   10.5    27    16.0
3 10 MG      2430    .980   13.08  1850   14.303  13835      235    1915    594    .147    34.6    281   87.3    57    10.0
4 16 MG      2004   1.530   12.75   738   14.480   9253      128    1976    157    .077     9.9    152   12.1    27    16.0
5 19 MG      1698   1.380   12.87   338   14.420   7076       83    1368     55    .057     4.7     78    3.1    10    19.0
6 16 MG      1922   1.300   12.80   750   14.292   9253      124    1700    161    .077     9.6    131   12.4    27    16.0
7  3 MG      1697   1.630   12.59  1338   14.390  19233      227    4401    594    .113    25.6    497   67.1    80     3.0
8 16 MG      1982   1.470   12.85   750   14.518   9253      126    1893    159    .077     9.7    146   12.2    27    16.0
9 C.T.      38484   2.090    7.40    47   13.338   2409      694     761      3    .143    99.2    109     .4     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      8.1     64    7.9
1 IDLE       3326   1.940   11.83   100   14.103   2767       65     769      7    .232    15.1    178    1.5     0    18.0
2 16 MG      2283   1.340   12.75   700   14.318   9253      148    1749    150    .077    11.4    135   11.6    27    16.0
3 10 MG      2486   1.010   13.06  1862   14.319  13835      240    1971    597    .147    35.3    290   87.8    57    10.0
4 16 MG      2059   1.420   12.76   725   14.386   9253      132    1845    155    .077    10.2    142   11.9    27    16.0
5 19 MG      1698   1.400   12.90   363   14.470   7076       83    1383     59    .057     4.7     79    3.4    10    19.0
6 16 MG      2001   1.320   12.81   775   14.330   9253      129    1722    166    .077    10.0    133   12.8    27    16.0
7  3 MG      1890   1.590   12.62  1375   14.399  19233      252    4290    610    .113    28.5    485   68.9    80     3.0
8 16 MG      2264   1.440   12.83   738   14.496   9253      145    1857    156    .077    11.1    143   12.0    27    16.0
9 C.T.      42771   1.960    7.61    50   13.847   2409      743     687      3    .143   106.2     98     .4     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      8.8     64    8.0
1 IDLE       3326   1.940   11.83   100   14.103   2767       65     769      7    .232    15.1    178    1.5     0    18.0
2 16 MG      2595   1.360   12.81   713   14.429   9253      163    1762    152    .077    12.6    136   11.7    27    16.0
3 10 MG      2678    .990   13.12  1863   14.378  13835      259    1833    597    .147    38.0    270   87.8    57    10.0
4 16 MG      2116   1.440   12.76   700   14.412   9253      136    1868    149    .077    10.5    144   11.5    27    16.0
5 19 MG      1832   1.270   12.91   313   14.363   7076       90    1264     51    .057     5.1     72    2.9    10    19.0
6 16 MG      2170   1.260   12.80   788   14.277   9253      141    1650    170    .077    10.8    127   13.1    27    16.0
7  3 MG      1868   1.620   12.66  1375   14.467  19233      248    4351    607    .113    28.1    492   68.6    80     3.0
8 16 MG      2152   1.500   12.83   750   14.545   9253      137    1928    158    .077    10.5    148   12.2    27    16.0
9 C.T.      42037   2.010    7.60    55   13.814   2409      732     707      3    .143   104.6    101     .5     0    23.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------      9.0     63    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------      8.0     62    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------      8.9     64    8.0
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     8.0) + 0.65(     8.9) =    8.593   GM/BHP HR
                                       CO- NDIR 0.35(    62.4) + 0.65(    63.7) =   63.271   GM/BHP HR
                                       NO2-CL   0.35(     7.8) + 0.65(     8.0) =    7.915   GM/BHP HR
                                                              CORRECTED NO2 =    8.576   GM/BHP HR
                                                                       BSFC =     .709   LB/BHP HR
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                     TABLE [illegible]  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 440   TEST-92  MODEL   1973 CALIF ENGINE     06-27-73        K =1.088      HUM =112.3  GR/LB
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           CONCENTRATION AS MEASUR[illegible]  TOTAL    FUEL      CALCULATED GM/HR        WT.         WEIGHTED GM/HR            MAN.
MODE       HC        CO     CO2      NO    CARBON    CONS.      HC       CO      NO2   FACT.     HC       CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE     884    1.340    9.60     152    11.895    2767      222      630      12    .232     51.5     146     2.7      0    16.5
2 16 MG    148     .660   12.20     267    13.020    8256      101      895      56    .077      7.8      68     4.3     20    16.0
3 10 MG    135     .720   12.29     796    13.156   12383      137     1369     233    .147     20.2     201    34.3     96    10.0
4 16 MG     93     .690   12.27     310    13.060    8256       63      881      65    .077      4.9      68     5.0     20    16.0
5 19 MG     85     .700   12.20     318    12.992    6396       45      696      52    .057      2.6      40     3.0     12    19.0
6 16 MG     82     .620   12.23     299    12.939    8256       57      799      63    .077      4.4      62     4.9     20    16.0
7  3 MG    110    1.450   12.09    1907    13.659   19051      166     4085     652    .113     18.7     462    73.6     79     3.0
8 16 MG     78     .680   12.32     360    13.084    8256       53      867      75    .077      4.1      67     5.8     20    16.0
9 C.T.      94    1.640   12.59     130    14.332    4127       29      954      12    .143      4.2     136     1.8      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      5.3      55     6.0
1 IDLE     884    1.340    9.60     152    11.895    2767      222      630      12    .232     51.5     146     2.7      0    16.5
2 16 MG    115     .630   12.26     280    13.014    8256       79      807      59    .077      6.1      62     4.5     20    16.0
3 10 MG    111     .700   12.40     777    13.220   12383      112     1324     242    .147     16.5     195    35.5     96    10.0
4 16 MG     77     .670   12.32     316    13.073    8256       53      855      66    .077      4.0      66     5.1     20    16.0
5 19 MG     75     .730   12.26     311    13.071    6396       40      722      51    .057      2.3      41     2.9     12    19.0
6 16 MG     73     .640   12.30     313    13.019    8256       50      820      66    .077      3.8      63     5.1     20    16.0
7  3 MG     93    1.470   12.14    1939    13.710   19051      140     4126     669    .113     15.8     466    75.6     79     3.0
8 16 MG     69     .700   12.36     337    13.135    8256       47      889      70    .077      3.6      68     5.4     20    16.0
9 C.T.      86    1.730   12.72     120    14.543    4127       26      992      11    .143      3.8     142     1.6      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      4.8      55     6.1
1 IDLE     532    1.810   10.06     168    12.445    2767      128      813      12    .232     29.6     189     2.9      0    16.5
2 16 MG    100     .600   12.27     276    12.978    8256       69      771      58    .077      5.3      59     4.5     20    16.0
3 10 MG    103     .650   12.36     710    13.121   12383      105     1239     222    .147     15.4     182    32.7     96    10.0
4 16 MG     73     .740   12.36     316    13.179    8256       49      960      66    .077      3.8      74     5.1     20    16.0
5 19 MG     66     .640   12.25     311    12.961    6396       35      638      51    .057      2.0      36     2.9     12    19.0
6 16 MG     67     .620   12.26     315    12.952    8256       46      798      67    .077      3.6      61     5.1     20    16.0
7  3 MG     91    1.510   12.14    1953    13.748   19051      136     4227     668    .113     15.4     478    75.5     79     3.0
8 16 MG     63     .590   12.36     324    13.018    8256       43      756      68    .077      3.3      58     5.3     20    16.0
9 C.T.     110    1.480   12.59     127    14.189    4127       35      870      12    .143      4.9     124     1.8      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      3.7      56     6.0
1 IDLE     532    1.810   10.06     168    12.445    2767      128      813      12    .232     29.6     189     2.9      0    16.5
2 16 MG    100     .620   12.29     278    13.018    8256       68      794      59    .077      5.3      61     4.5     20    16.0
3 10 MG    105     .640   12.37     787    13.123   12383      107     1220     228    .147     15.7     179    33.5     96    10.0
4 16 MG     71     .630   12.28     308    12.987    8256       49      809      65    .077      3.8      62     5.0     20    16.0
5 19 MG     69     .770   12.33     331    13.175    6396       36      755      53    .057      2.1      43     3.0     12    19.0
6 16 MG     69     .630   12.28     303    12.985    8256       47      809      64    .077      3.6      62     4.9     20    16.0
7  3 MG     92    1.400   12.15    1905    13.649   19051      139     3947     697    .113     15.7     446    78.8     79     3.0
8 16 MG     64     .690   12.34     334    13.099    8256       44      878      70    .077      3.4      68     5.4     20    16.0
9 C.T.     118    1.530   12.59     134    14.248    4127       36      895      13    .143      5.2     128     1.8      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      3.7      55     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLE[illegible] AND 2)-------------------------------------      5.0      55     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLE[illegible] AND 4)-------------------------------------      3.7      55     6.1
FOUR CYCLE COMPOSITE =
                                  HC- N[illegible] 0.35(     5.0) + 0.65(     3.7) =    4.172   GM/BHP HR
                                  CO- NDIR 0.35(    55.4) + 0.65(    55.5) =   55.455   GM/BHP HR
                                  NO2-NDIR 0.35(     6.1) + 0.65(     6.1) =    6.098   GM/BHP HR
                                                         CORRECTED NO2 =    6.637   GM/BHP HR
                                                                  BSFC =     .794   LB/BHP HR
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           CONCENTRATION AS MEASURED       TOTAL    FUEL      CALCULATED GM/HR        WT.         WEIGHTED GM/HR            MAN.
MODE       HC-FID    CO     CO2   NO-CL    CARBON    CONS.      HC       CO      NO2   FACT.   HC-FID     CO   NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE   10571    1.340    9.60      87    11.997    2767      244      624       7    .232     56.6     145     1.5      0    16.5
2 16 MG   1567     .660   12.20     200    13.017    8256       99      846      42    .077      7.7      65     3.2     20    16.0
3 10 MG   1983     .720   12.29     650    13.208   12383      186     1369     202    .147     27.3     200    29.7     96    10.0
4 16 MG   1424     .690   12.27     250    13.102    8256       90      878      52    .077      6.9      68     4.0     20    16.0
5 19 MG   1344     .700   12.20     250    13.034    6396       66      694      41    .057      3.8      40     2.3     12    19.0
6 16 MG   1399     .620   12.23     237    12.990    8256       89      796      50    .077      6.8      61     3.9     20    16.0
7  3 MG   1913    1.450   12.09    1325    13.731   19051      265     4064     610    .113     30.0     459    69.0     79     3.0
8 16 MG   1423     .680   12.32     275    13.142    8256       89      863      57    .077      6.9      66     4.4     20    16.0
9 C.T.    1222    1.640   12.59      63    14.352    4127       35      953       6    .143      5.0     136      .9      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      6.7      55     5.3
1 IDLE   10571    1.340    9.60      87    11.997    2767      244      624       7    .232     56.6     145     1.5      0    16.5
2 16 MG   1623     .630   12.26     225    13.052    8256      103      805      47    .077      7.9      62     3.6     20    16.0
3 10 MG   2041     .700   12.40     687    13.304   12383      190     1316     212    .147     27.9     193    31.2     96    10.0
4 16 MG   1367     .670   12.32     250    13.127    8256       86      851      52    .077      6.6      66     4.0     20    16.0
5 19 MG   1367     .730   12.26     262    13.127    6396       67      714      42    .057      3.8      41     2.4     12    19.0
6 16 MG   1400     .640   12.30     262    13.080    8256       88      816      55    .077      6.8      63     4.2     20    16.0
7  3 MG   1801    1.470   12.14    1350    13.790   19051      249     4102     619    .113     28.1     464    70.0     79     3.0
8 16 MG   1367     .700   12.36     287    13.197    8256       86      885      60    .077      6.6      68     4.6     20    16.0
9 C.T.    1128    1.730   12.72      63    14.563    4127       32      990       6    .143      4.6     142      .8      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      6.6      55     5.4
1 IDLE    7991    1.810   10.06     100    12.669    2767      175      799       7    .232     40.5     185     1.7      0    16.5
2 16 MG    811     .600   12.27     212    12.951    8256       52      773      45    .077      4.0      59     3.5     20    16.0
3 10 MG   1036     .650   12.36     650    13.114   12383       98     1240     204    .147     14.4     182    30.0     96    10.0
4 16 MG    729     .760   12.36     275    13.193    8256       46      961      57    .077      3.5      74     4.4     20    16.0
5 19 MG    700     .640   12.25     275    12.960    6396       35      638      45    .057      2.0      36     2.6     12    19.0
6 16 MG    671     .620   12.26     250    12.947    8256       43      799      53    .077      3.3      61     4.1     20    16.0
7  3 MG    957    1.510   12.14    1350    13.746   19051      133     4227     621    .113     15.0     478    70.2     79     3.0
8 16 MG    672     .590   12.36     287    13.017    8256       43      756      60    .077      3.3      58     4.7     20    16.0
9 C.T.    1469    1.480   12.59      75    14.217    4127       43      868       7    .143      6.1     124     1.0      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      4.1      56     5.4
1 IDLE    7991    1.810   10.06     100    12.669    2767      175      799       7    .232     40.5     185     1.7      0    16.5
2 16 MG    812     .620   12.29     225    12.991    8256       52      796      47    .077      4.0      61     3.7     20    16.0
3 10 MG   1036     .640   12.37     662    13.114   12383       98     1221     208    .147     14.4     179    30.5     96    10.0
4 16 MG    724     .630   12.28     262    12.983    8256       46      809      55    .077      3.6      62     4.3     20    16.0
5 19 MG    701     .770   12.33     275    13.170    6396       34      755      44    .057      1.9      43     2.5     12    19.0
6 16 MG    728     .630   12.28     250    12.983    8256       47      809      53    .077      3.6      62     4.1     20    16.0
7  3 MG    928    1.400   12.15    1925    13.643   19051      130     3947     661    .113     14.7     446    74.7     79     3.0
8 16 MG    672     .690   12.34     275    13.097    8256       43      878      58    .077      3.3      68     4.4     20    16.0
9 C.T.    1526    1.530   12.59      75    14.273    4127       44      894       7    .143      6.3     128     1.0      0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------------      4.1      55     5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------------      6.7      55     5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------------      4.1      55     5.5
FOUR CYCLE COMPOSITE =
                                  HC- FID  0.35(     6.7) + 0.65(     4.1) =    4.985   GM/BHP HR
                                  CO- NDIR 0.35(    55.1) + 0.65(    55.4) =   55.270   GM/BHP HR
                                  NO2-CL   0.35(     5.4) + 0.65(     5.5) =    5.466   GM/BHP HR
                                                         CORRECTED NO2 =    5.948   GM/BHP HR
                                                                  BSFC =     .794   LB/BHP HR
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                        TABLE D-8.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-B   TEST-42  RUN-2   1973 CALIF ENGINE     06-27-73      K =1.106     HUM =126.2  GR/LB
-----------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2     NO   CARBON   CONS.       HC      CO    NO2   FACT.    HC       CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE        617   1.910   10.01    139   12.586    2767      146     848     10   .232    34.0     197    2.3     0    16.5
2 16 HG       119    .660   12.52    218   13.309    8256       80     827     45   .077     6.1      64    3.5    20    16.0
3 10 HG       112    .670   12.64    692   13.931   12383      112    1248    212   .147    16.4     183   31.1    46    10.0
4 16 HG        77    .670   12.63    263   13.383    8256       51     835     54   .077     4.0      64    4.1    20    16.0
5 19 HG        76    .800   12.57    288   13.452    6396       39     768     45   .057     2.2      44    2.6    12    19.0
6 16 HG        77    .830   12.53    267   13.443    8256       51    1030     54   .077     3.9      79    4.2    20    16.0
7  3 HG        95   1.930   12.36   1396   13.893   19051      141    3961    613   .113    15.9     448   69.2    79     3.0
8 16 HG        70    .690   12.65    291   13.916    8256       47     858     59   .077     3.6      66    4.6    20    16.0
9 C.T.         85   1.980   12.95    116   14.022    4127       27     880     11   .143     3.9     126    1.6     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.0      56    5.5
1 IDLE        617   1.910   10.01    139   12.586    2767      146     848     10   .232    34.0     197    2.3     0    16.5
2 16 HG       121    .620   12.52    233   13.271    8256       81     779     48   .077     6.3      60    3.7    20    16.0
3 10 HG       111    .730   12.64    713   13.990   12383      110    1354    217   .147    16.2     199   31.9    46    10.0
4 16 HG        79    .600   12.63    286   13.315    8256       53     751     59   .077     4.1      58    4.5    20    16.0
5 19 HG        76    .800   12.57    283   13.452    6396       39     768     45   .057     2.2      44    2.5    12    19.0
6 16 HG        75    .690   12.53    278   13.251    8256       50     805     58   .077     3.9      62    4.4    20    16.0
7  3 HG        96   1.990   12.36   1342   13.909   19051      142    3986    610   .113    16.1     450   69.0    79     3.0
8 16 HG        69    .660   12.65    300   13.385    8256       46     822     61   .077     3.5      63    4.7    20    16.0
9 C.T.        120   1.560   12.59    101   14.280    4127       37     911     10   .143     5.4     130    1.9     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.1      56    5.5
1 IDLE        801   1.990   10.15    144   12.995    2767      184     852     10   .232    42.7     198    2.4     0    16.5
2 16 HG       109    .600   12.98    235   13.198    8256       74     758     49   .077     5.7      58    3.8    20    16.0
3 10 HG       112    .730   12.59    707   13.991   12383      111    1359    216   .147    16.4     200   31.8    46    10.0
4 16 HG        78    .650   12.58    266   13.314    8256       52     814     55   .077     4.0      63    4.2    20    16.0
5 19 HG        78    .860   12.95    286   13.394    6396       40     830     45   .057     2.3      47    2.6    12    19.0
6 16 HG        72    .580   12.96    276   13.118    8256       49     737     58   .077     3.8      57    4.4    20    16.0
7  3 HG        97   1.960   12.38   1391   13.995   19051      143    4029    608   .113    16.2     455   68.7    79     3.0
8 16 HG        68    .690   12.63    296   13.393    8256       45     800     61   .077     3.5      62    4.7    20    16.0
9 C.T.        110   1.520   12.72    115   14.359    4127       34     882     11   .143     4.9     126    1.6     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.4      56    5.5
1 IDLE        801   1.980   10.15    144   12.995    2767      184     852     10   .232    42.7     198    2.4     0    16.5
2 16 HG       106    .530   12.51    242   13.154    8256       72     672     50   .077     5.5      52    3.9    20    16.0
3 10 HG       111    .690   12.66    734   13.470   12383      110    1281    226   .147    16.2     188   33.2    46    10.0
4 16 HG        78    .670   12.54    270   13.294    8256       52     840     56   .077     4.0      65    4.3    20    16.0
5 19 HG        75    .800   12.50    305   13.381    6396       39     772     48   .057     2.2      44    2.8    12    19.0
6 16 HG        72    .620   12.55    258   13.248    8256       48     780     53   .077     3.7      60    4.1    20    16.0
7  3 HG        95   1.380   12.42   1333   13.903   19051      141    3820    606   .113    15.9     432   68.5    79     3.0
8 16 HG        67    .690   12.63    289   13.392    8256       45     864     59   .077     3.4      66    4.6    20    16.0
9 C.T.         92   1.560   12.59    128   14.299    4127       29     913     12   .143     4.1     131    1.8     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.3      55    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     4.0      56    5.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     4.4      55    5.5
FOUR CYCLE COMPOSITE =                 HC- NDIR 0.35(     4.0) + 0.65(     4.4) =    4.256   GM/BHP HR
                                       CO- NDIR 0.35(    56.2) + 0.65(    55.5) =   55.750   GM/BHP HR
                                       NO2-NDIR 0.35(     5.5) + 0.65(     5.5) =    5.524   GM/BHP HR
                                                           CORRECTED NO2 =    6.108   GM/BHP HR
                                                                    BSFC =     .294   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE        HC-FID     CO     CO2  NO-CL   CARBON   CONS.       HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE       8327   1.910   10.01     87   12.753    2767      181     837      6   .232    41.9     194    1.5     0    16.5
2 16 HG      1515    .660   12.52    200   13.331    8256       94     826     41   .077     7.2      64    3.2    20    16.0
3 10 HG      1876    .670   12.64    625   13.498   12383      172    1242    190   .147    25.3     183   28.0    46    10.0
4 16 HG      1291    .670   12.63    237   13.429    8256       79     832     48   .077     6.1      64    3.7    20    16.0
5 19 HG      1371    .800   12.57    237   13.507    6396       65     765     37   .057     3.7      44    2.1    12    19.0
6 16 HG      1292    .830   12.53    237   13.484    8256       79    1026     48   .077     6.1      79    3.7    20    16.0
7  3 HG      1770   1.930   12.36   1237   13.967   19051      241    3940    560   .113    27.3     445   63.3    79     3.0
8 16 HG      1319    .690   12.65    262   13.471    8256       81     854     53   .077     6.2      66    4.1    20    16.0
9 C.T.       1355   1.980   12.95     87   14.065    4127       40     877      8   .143     5.7     125    1.2     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.7      56    4.9
1 IDLE       8327   1.910   10.01     87   12.753    2767      181     837      6   .232    41.9     194    1.5     0    16.5
2 16 HG      1593    .620   12.52    212   13.299    8256       99     777     44   .077     7.6      60    3.4    20    16.0
3 10 HG      1989    .730   12.64    662   13.569   12383      182    1346    201   .147    26.7     198   29.5    46    10.0
4 16 HG      1347    .600   12.63    250   13.365    8256       83     749     51   .077     6.4      58    3.9    20    16.0
5 19 HG      1315    .800   12.57    250   13.501    6396       62     766     39   .057     3.5      44    2.2    12    19.0
6 16 HG      1313    .690   12.53    250   13.301    8256       81     802     52   .077     6.3      62    4.0    20    16.0
7  3 HG      1804   1.990   12.36   1287   13.980   19051      246    3964    582   .113    27.8     448   65.8    79     3.0
8 16 HG      1258    .660   12.65    275   13.436    8256       77     814     56   .077     6.0      63    4.3    20    16.0
9 C.T.       1572   1.560   12.59     75   14.307    4127       45     909      7   .143     6.5     130    1.0     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.9      56    5.1
1 IDLE       8230   1.980   10.15    100   12.953    2767      176     854      7   .232    40.8     198    1.6     0    16.5
2 16 HG      1980    .600   12.98    200   13.228    8256       92     756     41   .077     7.1      58    3.2    20    16.0
3 10 HG      2022    .730   12.59    631   13.522   12383      185    1350    192   .147    27.2     199   28.2    46    10.0
4 16 HG      1291    .650   12.58    237   13.359    8256       80     811     49   .077     6.1      62    3.7    20    16.0
5 19 HG      1348    .860   12.95    250   13.445    6396       64     826     39   .057     3.7      47    2.3    12    19.0
6 16 HG      1289    .580   12.96    237   13.169    8256       81     735     49   .077     6.2      57    3.8    20    16.0
7  3 HG      1805   1.960   12.38   1250   14.020   19051      245    4007    564   .113    27.7     453   63.7    79     3.0
8 16 HG      1235    .690   12.63    262   13.399    8256       76     797     54   .077     5.9      61    4.1    20    16.0
9 C.T.       1408   1.520   12.72     80   14.381    4127       40     881      8   .143     5.8     126    1.1     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.8      56    5.0
1 IDLE       8230   1.980   10.15    100   12.953    2767      176     854      7   .232    40.8     198    1.6     0    16.5
2 16 HG      1979    .530   12.51    212   13.188    8256       93     670     44   .077     7.1      52    3.4    20    16.0
3 10 HG      2022    .690   12.66    650   13.552   12383      185    1274    197   .147    27.2     187   29.0    46    10.0
4 16 HG      1347    .670   12.54    237   13.395    8256       83     837     49   .077     6.4      64    3.7    20    16.0
5 19 HG      1291    .800   12.50    250   13.429    6396       62     770     40   .057     3.5      44    2.3    12    19.0
6 16 HG      1290    .620   12.55    225   13.299    8256       80     777     46   .077     6.2      60    3.6    20    16.0
7  3 HG      1804   1.380   12.42   1287   13.980   19051      246    3799    582   .113    27.8     429   65.8    79     3.0
8 16 HG      1236    .690   12.63    262   13.444    8256       76     856     53   .077     5.8      66    4.1    20    16.0
9 C.T.       1250   1.560   12.59     87   14.275    4127       36     911      8   .143     5.2     130    1.2     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.8      55    5.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     5.8      56    5.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     5.8      55    5.0
FOUR CYCLE COMPOSITE =                 HC- FID  0.35(     5.8) + 0.65(     5.8) =    5.793   GM/BHP HR
                                       CO- NDIR 0.35(    55.9) + 0.65(    55.3) =   55.516   GM/BHP HR
                                       NO2-CL   0.35(     5.0) + 0.65(     5.0) =    5.025   GM/BHP HR
                                                           CORRECTED NO2 =    5.557   GM/BHP HR
                                                                    BSFC =     .294   LB/BHP HR
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TABLE D-9. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 4-0 TEST-42 RUN-3 1973 CALIF ENGINE 06-27-73 K =1.099 HUM =120.2 GR/LB

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC	CO	CO2	NO	CARBON	CONS.	HC	CO	NO2	FACT.	HC	CO	NO2	HP	VAC.
1 IDLE	807	1.820	9.63	126	12.322	2767	196	826	9	.232	45.4	192	2.2	0	16.5
2 16 HG	155	.750	12.33	269	13.247	8256	104	944	56	.077	8.0	73	4.3	20	16.0
3 10 HG	122	.740	12.52	692	13.392	12383	122	1382	212	.147	17.9	203	31.2	46	10.0
4 16 HG	89	.650	12.53	291	13.276	8256	60	817	60	.077	4.6	63	4.6	20	16.0
5 19 HG	83	.840	12.43	317	13.360	6396	43	812	50	.057	2.4	46	2.9	12	19.0
6 16 HG	79	.610	12.51	288	13.205	8256	53	770	60	.077	4.1	59	4.6	20	16.0
7 3 HG	96	1.480	12.40	1355	13.984	19051	141	4073	613	.113	16.0	460	69.3	79	3.0
8 16 HG	74	.680	12.61	340	13.370	8256	49	848	70	.077	3.8	65	5.4	20	16.0
9 C.T.	104	1.630	12.72	165	14.462	4127	32	940	16	.143	4.6	134	2.2	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											4.7	58	5.6		
1 IDLE	807	1.820	9.63	126	12.322	2767	196	826	9	.232	45.4	192	2.2	0	16.5
2 16 HG	108	.640	12.40	283	13.157	8256	73	811	59	.077	5.6	62	4.5	20	16.0
3 10 HG	105	.650	12.54	728	13.303	12383	106	1222	225	.147	15.5	180	33.1	46	10.0
4 16 HG	75	.630	12.52	299	13.231	8256	51	794	62	.077	3.9	61	4.8	20	16.0
5 19 HG	74	.850	12.44	305	13.370	6396	38	821	48	.057	2.2	47	2.8	12	19.0
6 16 HG	71	.610	12.45	275	13.137	8256	48	774	57	.077	3.7	60	4.4	20	16.0
7 3 HG	92	1.590	12.34	1405	14.029	19051	135	4361	633	.113	15.2	493	71.6	79	3.0
8 16 HG	68	.660	12.57	323	13.303	8256	46	827	67	.077	3.5	64	5.1	20	16.0
9 C.T.	710	1.630	12.72	173	15.117	4127	209	899	16	.143	29.9	129	2.2	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											5.5	57	5.8		
1 IDLE	811	2.110	10.05	137	13.036	2767	186	905	10	.232	43.1	210	2.2	0	16.5
2 16 HG	112	.640	12.46	271	13.221	8256	76	807	56	.077	5.8	62	4.3	20	16.0
3 10 HG	102	.650	12.59	759	13.350	12383	102	1218	234	.147	15.0	179	34.4	46	10.0
4 16 HG	71	.600	12.51	295	13.187	8256	48	759	61	.077	3.7	58	4.7	20	16.0
5 19 HG	67	.750	12.43	294	13.252	6396	35	731	47	.057	2.0	42	2.7	12	19.0
6 16 HG	72	.700	12.51	295	13.288	8256	48	879	61	.077	3.7	68	4.7	20	16.0
7 3 HG	91	1.510	12.36	1407	13.968	19051	134	4160	637	.113	15.1	470	72.0	79	3.0
8 16 HG	64	.660	12.54	306	13.269	8256	43	830	63	.077	3.3	64	4.9	20	16.0
9 C.T.	98	1.570	12.72	134	14.396	4127	30	909	13	.143	4.3	130	1.9	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											4.3	57	5.8		
1 IDLE	811	2.110	10.05	137	13.036	2767	186	905	10	.232	43.1	210	2.2	0	16.5
2 16 HG	106	.600	12.45	267	13.164	8256	72	760	56	.077	5.5	59	4.3	20	16.0
3 10 HG	106	.770	12.53	723	13.414	12383	106	1436	222	.147	15.5	211	32.6	46	10.0
4 16 HG	75	.720	12.58	292	13.381	8256	50	897	60	.077	3.8	69	4.6	20	16.0
5 19 HG	75	.840	12.39	329	13.311	6396	39	815	52	.057	2.2	46	3.0	12	19.0
6 16 HG	68	.580	12.52	280	13.173	8256	46	734	58	.077	3.5	57	4.5	20	16.0
7 3 HG	91	1.540	12.35	1370	13.988	19051	134	4237	619	.113	15.1	479	70.0	79	3.0
8 16 HG	65	.620	12.54	327	13.230	8256	44	782	68	.077	3.4	60	5.2	20	16.0
9 C.T.	119	1.630	12.59	131	14.349	4127	37	947	13	.143	5.3	135	1.8	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											4.3	59	5.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											5.1	57	5.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											4.3	58	5.8		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(5.1) + 0.65(4.3) = 4.596 GM/BHP HR
CO- NDIR 0.35(57.3) + 0.65(57.9) = 57.688 GM/BHP HR
NO2-NDIR 0.35(5.7) + 0.65(5.8) = 5.749 GM/BHP HR
CORRECTED NO2 = 6.319 GM/BHP HR
BSFC = .794 LB/BHP HR

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC-FID	CO	CO2	NO-CL	CARBON	CONS.	HC	CO	NO2	FACT.	HC-FID	CO	NO2-CL	HP	VAC.
1 IDLE	9400	1.820	9.63	87	12.390	2767	210	821	6	.232	48.7	190	1.5	0	16.5
2 16 HG	1513	.750	12.33	200	13.231	8256	94	945	41	.077	7.3	73	3.2	20	16.0
3 10 HG	1875	.740	12.52	600	13.447	12383	173	1376	183	.147	25.4	202	27.0	46	10.0
4 16 HG	1290	.650	12.53	237	13.309	8256	80	814	49	.077	6.2	63	3.8	20	16.0
5 19 HG	1291	.840	12.43	237	13.399	6396	62	810	38	.057	3.5	46	2.1	12	19.0
6 16 HG	1312	.610	12.51	225	13.251	8256	82	768	47	.077	6.3	59	3.6	20	16.0
7 3 HG	1715	1.480	12.40	1250	14.052	19051	233	4053	563	.113	26.3	458	63.6	79	3.0
8 16 HG	1259	.680	12.61	275	13.416	8256	77	845	56	.077	6.0	65	4.3	20	16.0
9 C.T.	1473	1.630	12.72	87	14.497	4127	42	937	8	.143	6.0	134	1.2	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											6.0	57	4.9		
1 IDLE	9400	1.820	9.63	87	12.390	2767	210	821	6	.232	48.7	190	1.5	0	16.5
2 16 HG	1457	.640	12.40	225	13.186	8256	91	809	47	.077	7.0	62	3.6	20	16.0
3 10 HG	1851	.650	12.54	650	13.375	12383	171	1216	200	.147	25.2	179	29.4	46	10.0
4 16 HG	1256	.630	12.52	250	13.276	8256	78	791	52	.077	6.0	61	4.0	20	16.0
5 19 HG	1348	.850	12.44	262	13.425	6396	64	818	41	.057	3.7	47	2.4	12	19.0
6 16 HG	1255	.610	12.45	237	13.186	8256	79	772	49	.077	6.1	59	3.8	20	16.0
7 3 HG	1716	1.590	12.34	1250	14.102	19051	232	4339	561	.113	26.2	490	63.4	79	3.0
8 16 HG	1235	.660	12.57	275	13.353	8256	76	824	56	.077	5.9	63	4.3	20	16.0
9 C.T.	1501	1.630	12.72	125	14.500	4127	43	937	12	.143	6.1	134	1.7	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											6.0	57	5.1		
1 IDLE	8900	2.110	10.05	100	13.050	2767	189	904	7	.232	43.8	210	1.6	0	16.5
2 16 HG	1514	.640	12.46	225	13.251	8256	94	805	47	.077	7.3	62	3.6	20	16.0
3 10 HG	1875	.650	12.59	662	13.427	12383	173	1211	203	.147	25.4	178	29.8	46	10.0
4 16 HG	1289	.600	12.51	262	13.239	8256	80	756	54	.077	6.2	58	4.2	20	16.0
5 19 HG	1346	.750	12.43	262	13.315	6396	65	728	42	.057	3.7	41	2.4	12	19.0
6 16 HG	1257	.700	12.51	250	13.336	8256	78	875	51	.077	6.0	67	4.0	20	16.0
7 3 HG	1749	1.510	12.36	1287	14.045	19051	237	4137	580	.113	26.8	468	65.5	79	3.0
8 16 HG	1201	.660	12.54	275	13.320	8256	74	826	57	.077	5.7	64	4.4	20	16.0
9 C.T.	1404	1.570	12.72	100	14.430	4127	40	907	9	.143	5.7	130	1.4	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											5.8	57	5.2		
1 IDLE	8900	2.110	10.05	100	13.050	2767	189	904	7	.232	43.8	210	1.6	0	16.5
2 16 HG	1457	.600	12.45	225	13.196	8256	91	758	47	.077	7.0	58	3.6	20	16.0
3 10 HG	1909	.770	12.53	650	13.491	12383	175	1428	198	.147	25.7	210	29.1	46	10.0
4 16 HG	1291	.720	12.58	262	13.429	8256	79	894	53	.077	6.1	69	4.1	20	16.0
5 19 HG	1347	.840	12.39	262	13.365	6396	64	812	42	.057	3.7	46	2.4	12	19.0
6 16 HG	1233	.580	12.52	250	13.223	8256	77	731	52	.077	5.9	56	4.0	20	16.0
7 3 HG	1715	1.540	12.35	1275	14.062	19051	232	4215	574	.113	26.3	476	64.8	79	3.0
8 16 HG	1234	.620	12.54	262	13.283	8256	77	778	54	.077	5.9	60	4.2	20	16.0
9 C.T.	1607	1.630	12.59	100	14.381	4127	46	945	10	.143	6.6	135	1.4	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											5.8	59	5.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											6.0	57	5.0		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											5.8	58	5.1		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(6.0) + 0.65(5.8) = 5.874 GM/BHP HR
CO- NDIR 0.35(57.2) + 0.65(57.7) = 57.497 GM/BHP HR
NO2-CL 0.35(5.0) + 0.65(5.1) = 5.087 GM/BHP HR
CORRECTED NO2 = 5.592 GM/BHP HR
BSFC = .794 LB/BHP HR

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                    TABLE D-10.MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-1    TEST-39  RUN=1   EGR-AIR-CAT            06-25-73        K =1.076      HUM =104.8  GR/LB
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                CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE            HC      CO     CO2      NO    CARBON    CONS.       HC       CO      NO2   FACT.   HC        CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE          99    .120   10.74     356    10.967     2812       27       62       30   .232    6.4       14    7.0     0    16.5
2 16 MG         29    .070   10.75     171    10.851     7847       23      102       41   .077    1.7        8    3.2    17    16.0
3 10 MG         29    .080   11.67     300    11.781    11431       30      157       97   .147    4.5       23   14.2    41    10.0
4 16 MG         22    .060   10.53     169    10.614     7847       18       90       40   .077    1.4        7    3.1    17    16.0
5 19 MG         26    .060    9.81     147     9.898     6486       18       79       32   .057    1.0        5    1.8    11    19.0
6 16 MG         24    .100   10.68     167    10.806     7847       19      147       40   .077    1.4       11    3.1    17    16.0
7  3 MG         26    .150   12.65    1266    12.828    18371       40      434      602   .113    4.5       49   68.0    77     3.0
8 16 MG         24    .060   10.68     241    10.766     7847       19       88       58   .077    1.5        7    4.5    17    16.0
9 C.T.          29    .060    8.99     130     9.081     4400       15       59       21   .143    2.2        8    3.0     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------   1.2        6    5.3
1 IDLE          99    .120   10.74     356    10.967     2812       27       62       30   .232    6.4       14    7.0     0    16.5
2 16 MG         29    .080   10.83     166    10.941     7847       22      116       40   .077    1.7        9    3.0    17    16.0
3 10 MG         26    .060   11.31     327    11.398    11431       28      122      109   .147    4.1       18   16.0    41    10.0
4 16 MG         22    .050   10.44     197    10.514     7847       18       75       49   .077    1.4        6    3.8    17    16.0
5 19 MG         24    .050    9.83     159     9.906     6486       17       66       35   .057    1.0        4    2.0    11    19.0
6 16 MG         25    .100   10.68     166    10.807     7847       20      147       40   .077    1.5       11    3.1    17    16.0
7  3 MG         25    .150   12.82    1179    12.997    18371       38      428      551   .113    4.3       48   62.3    77     3.0
8 16 MG         22    .060   10.37     209    10.454     7847       18       91       52   .077    1.4        7    4.0    17    16.0
9 C.T.          27    .060    8.66     115     8.749     4400       15       61       19   .143    2.1        9    2.7     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------   1.2        6    5.1
1 IDLE          54    .100   10.81     137    10.968     2812       15       52       12   .232    3.5       12    2.7     0    16.5
2 16 MG         28    .060   11.10     199    11.190     7847       21       85       45   .077    1.6        7    3.5    17    16.0
3 10 MG         24    .070   11.48     374    11.576    11431       26      140      123   .147    3.8       21   18.0    41    10.0
4 16 MG         21    .050   10.67     201    10.743     7847       17       74       49   .077    1.3        6    3.8    17    16.0
5 19 MG         21    .050   10.00     179    10.073     6486       15       65       38   .057     .8        4    2.2    11    19.0
6 16 MG         23    .060   10.86     179    10.945     7847       18       87       43   .077    1.4        7    3.3    17    16.0
7  3 MG         23    .120   12.88    1196    13.025    18371       35      342      560   .113    4.0       39   63.3    77     3.0
8 16 MG         19    .060   10.48     242    10.561     7847       15       90       60   .077    1.2        7    4.6    17    16.0
9 C.T.          28    .060    8.68     121     8.770     4400       15       61       20   .143    2.2        9    2.9     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------   1.0        5    5.1
1 IDLE          54    .100   10.81     137    10.968     2812       15       52       12   .232    3.5       12    2.7     0    16.5
2 16 MG         24   1.060   10.82     167    11.906     7847       17     1411       37   .077    1.3      109    2.8    17    16.0
3 10 MG         25    .080   11.64     404    11.747    11431       26      157      132   .147    3.9       23   19.4    41    10.0
4 16 MG         22    .050   10.51     201    10.584     7847       18       75       49   .077    1.4        6    3.8    17    16.0
5 19 MG         24    .050   10.06     183    10.136     6486       17       65       39   .057     .9        4    2.2    11    19.0
6 16 MG         23    .050   10.90     185    10.975     7847       18       72       44   .077    1.4        6    3.4    17    16.0
7  3 MG         24    .110   12.83    1192    12.966    18371       37      315      561   .113    4.1       36   63.4    77     3.0
8 16 MG         19    .050   10.08     224    10.151     7847       16       78       57   .077    1.2        6    4.4    17    16.0
9 C.T.          34    .060    8.66     124     8.757     4400       18       61       21   .143    2.6        9    3.0     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------   1.0       10    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------------   1.2        6    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------------   1.0        8    5.1
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(      1.2) + 0.65(      1.0) =     1.052   GM/BHP HR
                                       CO- NDIR 0.35(      6.3) + 0.65(      7.8) =     7.291   GM/BHP HR
                                       NO2-NDIR 0.35(      5.2) + 0.65(      5.1) =     5.150   GM/BHP HR
                                                                 CORRECTED NO2 =     5.540   GM/BHP HR
                                                                          BSFC =      .845   LB/BHP HR
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                CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID    CO     CO2   NO-CL    CARBON    CONS.       HC       CO      NO2   FACT.  HC-FID     CO  NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE        1048    .120   10.74     330    10.965     2812       27       62       28   .232    6.2       14    6.5     0    16.5
2 16 MG        179    .070   10.75     125    10.838     7847       13      102       30   .077    1.0        8    2.3    17    16.0
3 10 MG        187    .080   11.67     250    11.769    11431       18      157       81   .147    2.7       23   11.9    41    10.0
4 16 MG        179    .060   10.53     130    10.608     7847       13       90       32   .077    1.0        7    2.5    17    16.0
5 19 MG         96    .060    9.81     115     9.880     6486        6       80       25   .057     .4        5    1.4    11    19.0
6 16 MG        117    .100   10.68     125    10.792     7847        8      147       30   .077     .7       11    2.3    17    16.0
7  3 MG        140    .150   12.65    1200    12.814    18371       20      434      571   .113    2.3       49   64.5    77     3.0
8 16 MG         89    .060   10.68     200    10.749     7847        7       88       48   .077     .5        7    3.7    17    16.0
9 C.T.         196    .060    8.99      75     9.070     4400       10       59       12   .143    1.4        8    1.7     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------     .8        6    4.7
1 IDLE        1048    .120   10.74     330    10.965     2812       27       62       28   .232    6.2       14    6.5     0    16.5
2 16 MG        124    .080   10.83     110    10.922     7847        9      116       26   .077     .7        9    2.0    17    16.0
3 10 MG        159    .060   11.31     335    11.386    11431       16      122      112   .147    2.3       18   16.4    41    10.0
4 16 MG        103    .050   10.44     150    10.500     7847        8       75       37   .077     .6        6    2.9    17    16.0
5 19 MG         88    .050    9.83     125     9.889     6486        6       66       27   .057     .3        4    1.6    11    19.0
6 16 MG        124    .100   10.68     130    10.792     7847        9      147       31   .077     .7       11    2.4    17    16.0
7  3 MG        133    .150   12.82    1112    12.983    18371       19      429      522   .113    2.1       48   59.0    77     3.0
8 16 MG         82    .060   10.37     200    10.438     7847        6       91       50   .077     .5        7    3.8    17    16.0
9 C.T.         284    .060    8.66      60     8.748     4400       14       61       10   .143    2.0        9    1.4     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------     .8        6    4.7
1 IDLE         633    .100   10.81      85    10.973     2812       16       52        7   .232    3.8       12    1.7     0    16.5
2 16 MG        110    .060   11.10     110    11.171     7847        8       85       26   .077     .6        7    2.0    17    16.0
3 10 MG        159    .070   11.48     350    11.566    11431       16      140      115   .147    2.3       21   16.9    41    10.0
4 16 MG         97    .050   10.67     163    10.730     7847        7       74       40   .077     .5        6    3.0    17    16.0
5 19 MG         82    .050   10.00     130    10.058     6486        5       65       28   .057     .3        4    1.6    11    19.0
6 16 MG        103    .060   10.86     140    10.930     7847        7       87       33   .077     .6        7    2.6    17    16.0
7  3 MG        127    .120   12.88    1146    13.013    18371       18      342      537   .113    2.0       39   60.7    77     3.0
8 16 MG         76    .060   10.48     200    10.548     7847        6       90       49   .077     .4        7    3.8    17    16.0
9 C.T.         311    .060    8.68      65     8.771     4400       16       61       11   .143    2.2        9    1.5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------     .6        6    4.6
1 IDLE         633    .100   10.81      85    10.973     2812       16       52        7   .232    3.8       12    1.7     0    16.5
2 16 MG        118   1.060   10.82     120    11.892     7847        8     1413       26   .077     .6      109    2.0    17    16.0
3 10 MG        153    .080   11.64     350    11.735    11431       15      157      113   .147    2.2       23   16.6    41    10.0
4 16 MG         97    .050   10.51     160    10.570     7847        7       75       39   .077     .6        6    3.0    17    16.0
5 19 MG         75    .050   10.06     140    10.118     6486        5       65       30   .057     .3        4    1.7    11    19.0
6 16 MG         97    .050   10.90     140    10.960     7847        7       72       33   .077     .5        6    2.6    17    16.0
7  3 MG        187    .110   12.83    1125    12.953    18371       18      315      530   .113    2.0       36   59.9    77     3.0
8 16 MG         69    .050   10.08     200    10.137     7847        5       78       51   .077     .4        6    4.0    17    16.0
9 C.T.         391    .060    8.66      88     8.759     4400       20       61       15   .143    2.8        9    2.1     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------------     .6       10    4.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------------     .8        6    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------------     .6        8    4.6
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(       .8) + 0.65(       .6) =      .684   GM/BHP HR
                                       CO- NDIR 0.35(      6.3) + 0.65(      7.8) =     7.298   GM/BHP HR
                                       NO2-CL   0.35(      4.7) + 0.65(      4.6) =     4.639   GM/BHP HR
                                                                 CORRECTED NO2 =     4.990   GM/BHP HR
                                                                          BSFC =      .845   LB/BHP HR
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                        TABLE D-11. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-1   TEST 39  RUN 2   EGR-AIR-CAT            06-25-73      K =1.072      HUM =102.8  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR            MAN.
MODE             HC     CO     CO2     NO    CARBON   CONS.      HC      CO      NO2    FACT.    HC       CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE          127   .110    9.25    235    9.497    2812       41      66      23    .232     9.4      15    5.4     0    16.5
2 16 MG          24   .070   10.41    145   10.506    7847       19     106      36    .077     1.5       8    2.8    17    16.0
3 10 MG          19   .060   10.91    300   10.991   11431       21     126     104    .147     3.1      19   15.2    41    10.0
4 16 MG          18   .050    9.73    181    9.799    7847       16      81      48    .077     1.2       6    3.7    17    16.0
5 19 MG          27   .060   10.12    181   10.209    6486       19      77      38    .057     1.1       4    2.2    11    19.0
6 16 MG          19   .050   10.34    173   10.411    7847       15      76      43    .077     1.2       6    3.3    17    16.0
7  3 MG          19   .120   12.54   1326   12.681   18371       30     351     638    .113     3.4      40   72.1    77     3.0
8 16 MG          19   .060    9.47    260    9.551    7847       17     100      71    .077     1.3       8    5.5    17    16.0
9 C.T.           21   .050    8.31    191    8.383    4400       12      53      25    .143     1.7       8    3.5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.2       6    5.6
1 IDLE          127   .110    9.25    235    9.497    2812       41      66      23    .232     9.4      15    5.4     0    16.5
2 16 MG          21   .050   10.18    135   10.253    7847       17      77      34    .077     1.3       6    2.6    17    16.0
3 10 MG          17   .060   10.60    350   10.678   11431       20     130     124    .147     2.9      19   18.3    41    10.0
4 16 MG          18   .050    9.76    173    9.829    7847       16      81      46    .077     1.2       6    3.5    17    16.0
5 19 MG          18   .060    9.36    160    9.439    6486       13      83      36    .057      .8       5    2.1    11    19.0
6 16 MG          17   .060   10.25    164   10.328    7847       14      92      41    .077     1.1       7    3.2    17    16.0
7  3 MG          19   .150   12.40   1204   12.571   18371       30     443     584    .113     3.4      50   66.0    77     3.0
8 16 MG          15   .060    9.61    217    9.686    7847       13      98      58    .077     1.0       8    4.5    17    16.0
9 C.T.           26   .050    8.23    108    8.308    4400       15      53      19    .143     2.1       8    2.7     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.1       6    5.3
1 IDLE           37   .080    9.67    127    9.790    2812       11      46      12    .232     2.7      11    2.8     0    16.5
2 16 MG          19   .060   10.18    132   10.261    7847       16      93      34    .077     1.2       7    2.6    17    16.0
3 10 MG          19   .100   11.48    448   11.601   11431       20     199     147    .147     3.0      29   21.5    41    10.0
4 16 MG          17   .060    9.71    191    9.788    7847       15      97      51    .077     1.1       7    3.9    17    16.0
5 19 MG          19   .060    9.44    160    9.521    6486       14      83      36    .057      .8       5    2.1    11    19.0
6 16 MG          16   .060    9.90    166    9.977    7847       14      95      43    .077     1.0       7    3.3    17    16.0
7  3 MG          19   .110   12.30   1167   12.431   18371       30     328     573    .113     3.4      37   64.7    77     3.0
8 16 MG          14   .060    9.51    213    9.586    7847       12      99      58    .077     1.0       8    4.5    17    16.0
9 C.T.           35   .060    8.07    102    8.168    4400       20      65      18    .143     2.9       9    2.6     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .8       6    5.3
1 IDLE           37   .080    9.67    127    9.790    2812       11      46      12    .232     2.7      11    2.8     0    16.5
2 16 MG          18   .060    9.83    140    9.909    7847       15      96      37    .077     1.2       7    2.8    17    16.0
3 10 MG          20   .070   10.97    388   11.062   11431       22     146     133    .147     3.3      21   19.6    41    10.0
4 16 MG          18   .050    9.82    147    9.889    7847       15      80      52    .077     1.2       6    4.0    17    16.0
5 19 MG          18   .060    9.23    160    9.309    6486       14      84      37    .057      .8       5    2.1    11    19.0
6 16 MG          18   .060    9.78    162    9.859    7847       15      96      43    .077     1.2       7    3.3    17    16.0
7  3 MG          19   .120   12.35   1161   12.491   18371       30     357     567    .113     3.4      40   64.1    77     3.0
8 16 MG          17   .060   10.01    224   10.088    7847       14      94 [illegible]   .077     1.1       7    4.5    17    16.0
9 C.T.           33   .060    7.96    101    8.056    4400       19      66      18    .143     2.8       9    2.6     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .9       6    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------  1.2       6    5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------   .9       6    5.2
FOUR CYCLE COMPOSITE =                HC= NDIR 0.35(      1.2) + 0.65(       .9) =     .956   GM/BHP HR
                                      CO= NDIR 0.35(      5.8) + 0.65(      5.8) =    5.789   GM/BHP HR
                                      NO2=NDIR 0.35(      5.4) + 0.65(      5.2) =    5.308   GM/BHP HR
                                                                  CORRECTED NO2 =    5.689   GM/BHP HR
                                                                           BSFC =     .845   LB/BHP HR


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              CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR            MAN.
MODE          HC-FID     CO     CO2   NO-CL  CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID     CO  NO2-CL  HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         1032   .110    9.25    190    9.463    2812       31      66      19    .232     7.1      15    4.3     0    16.5
2 16 MG         151   .070   10.41    100   10.495    7847       11     106      25    .077      .9       8    1.9    17    16.0
3 10 MG         159   .060   10.91    280   10.986   11431       17     126      97    .147     2.4      19   14.2    41    10.0
4 16 MG          88   .050    9.73    155    9.789    7847        7      81      41    .077      .5       6    3.2    17    16.0
5 19 MG          69   .060   10.12    140   10.187    6486        4      77      30    .057      .3       4    1.7    11    19.0
6 16 MG          96   .050   10.34    145   10.400    7847        7      76      36    .077      .6       6    2.8    17    16.0
7  3 MG         112   .120   12.54   1281   12.671   18371       16     351     617    .113     1.8      40   69.7    77     3.0
8 16 MG          54   .060    9.47    613    9.535    7847        4     100     167    .077      .3       8   12.9    17    16.0
9 C.T.          256   .050    8.31    100    8.386    4400       13      53      17    .143     1.9       8    2.5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .8       6    5.5
1 IDLE         1032   .110    9.25    190    9.463    2812       31      66      19    .232     7.1      15    4.3     0    16.5
2 16 MG         109   .050   10.18    100   10.241    7847        8      77      25    .077      .6       6    2.0    17    16.0
3 10 MG         131   .060   10.60    340   10.673   11431       14     130     121    .147     2.1      19   17.8    41    10.0
4 16 MG          82   .050    9.76    150    9.818    7847        7      81      40    .077      .5       6    3.1    17    16.0
5 19 MG          61   .060    9.36    130    9.426    6486        4      83      30    .057      .2       5    1.7    11    19.0
6 16 MG          76   .060   10.25    140   10.318    7847        6      92      35    .077      .4       7    2.7    17    16.0
7  3 MG          98   .150   12.40   1150   12.560   18371       14     443     558    .113     1.6      50   63.1    77     3.0
8 16 MG          61   .060    9.61    212    9.676    7847        5      98      57    .077      .4       8    4.4    17    16.0
9 C.T.          283   .050    8.23     75    8.308    4400       15      53      13    .143     2.1       8    1.9     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .7       6    4.9
1 IDLE          341   .080    9.67    100    9.784    2812       10      46      10    .232     2.3      11    2.2     0    16.5
2 16 MG         103   .060   10.18    110   10.250    7847        8      93      28    .077      .6       7    2.2    17    16.0
3 10 MG         138   .100   11.48    385   11.594   11431       14     199     126    .147     2.0      29   18.5    41    10.0
4 16 MG          75   .060    9.71    163    9.778    7847        6      97      43    .077      .5       7    3.3    17    16.0
5 19 MG          61   .060    9.44    144    9.506    6486        4      83      33    .057      .2       5    1.9    11    19.0
6 16 MG          82   .060    9.90    143    9.968    7847        6      95      37    .077      .5       7    2.9    17    16.0
7  3 MG          98   .110   12.30   1125   12.420   18371       15     329     552    .113     1.6      37   62.4    77     3.0
8 16 MG          54   .060    9.51    190    9.575    7847        4      99      52    .077      .3       8    4.0    17    16.0
9 C.T.          376   .060    8.07     75    8.168    4400       20      65      13    .143     2.9       9    1.9     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .5       6    4.9
1 IDLE          341   .080    9.67    100    9.784    2812       10      46      10    .232     2.3      11    2.2     0    16.5
2 16 MG          96   .060    9.83    110    9.900    7847        8      96      29    .077      .6       7    2.2    17    16.0
3 10 MG         125   .070   10.97    360   11.052   11431       13     146     124    .147     1.9      21   18.2    41    10.0
4 16 MG          69   .050    9.82    165    9.877    7847        5      80      44    .077      .4       6    3.4    17    16.0
5 19 MG          54   .060    9.23    140    9.295    6486        4      85      32    .057      .2       5    1.8    11    19.0
6 16 MG          69   .050    9.78    140    9.847    7847        5      97      37    .077      .4       7    2.9    17    16.0
7  3 MG          98   .120   12.35   1100   12.480   18371       14     357     538    .113     1.6      40   60.7    77     3.0
8 16 MG          55   .060   10.01    143   10.078    7847        4      94      50    .077      .3       7    3.8    17    16.0
9 C.T.          375   .060    7.96     75    8.058    4400       21      66      14    .143     2.9       9    1.9     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .5       6    4.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------   .8       6    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------   .5       6    4.8
FOUR CYCLE COMPOSITE =                HC= FID  0.35(       .8) + 0.65(       .5) =     .611   GM/BHP HR
                                      CO= NDIR 0.35(      5.8) + 0.65(      5.8) =    5.799   GM/BHP HR
                                      NO2=CL   0.35(      5.2) + 0.65(      4.8) =    4.967   GM/BHP HR
                                                                  CORRECTED NO2 =    5.323   GM/BHP HR
                                                                           BSFC =     .845   LB/BHP HR
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                 TABLE D-12. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-1    TEST 39  RUN-3   EGR-AIR-CAT            06-25-73      K =1.076      HUM =105.0  GR/LB
---------------------------------------------------------------------------------------------------------------
            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR        MAN.
MODE        HC     CO     CO2     NO     CARBON   CONS.     HC     CO     NO2    FACT.    HC     CO    NO2   HP   VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE      74    .110    9.99    250    10.180   2812      22     61     23     .232     5.1    14    5.3    0   16.5
2 16 MG     21    .060   10.06    196    10.143   7847      18     94     50     .077     1.4     7    3.9   17   16.0
3 10 MG     22    .060   11.18    473    11.264  11431      24    123    159     .147     3.5    18   23.4   41   10.0
4 16 MG     18    .060    9.98    236    10.059   7847      15     95     61     .077     1.2     7    4.7   17   16.0
5 19 MG     18    .050    9.36    199     9.429   6486      13     69     45     .057      .8     4    2.6   11   19.0
6 16 MG     18    .050   10.03    198    10.099   7847      15     79     51     .077     1.2     6    3.9   17   16.0
7  3 MG     19    .100   12.47   1205    12.591  18371      30    295    584     .113     3.4    33   66.0   77    3.0
8 16 MG     15    .060   10.14    248    10.216   7847      12     93     63     .077     1.0     7    4.9   17   16.0
9 C.T.      37    .060    8.26    124     8.360   4400      21     64     22     .143     3.0     9    3.1    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      1.0     5    5.8
1 IDLE      74    .110    9.99    250    10.180   2812      22     61     23     .232     5.1    14    5.3    0   16.5
2 16 MG     19    .060   10.11    151    10.191   7847      16     93     39     .077     1.2     7    3.0   17   16.0
3 10 MG     20    .070   11.09    369    11.182  11431      22    145    125     .147     3.2    21   18.4   41   10.0
4 16 MG     18    .060    9.64    169     9.719   7847      16     98     46     .077     1.2     8    3.5   17   16.0
5 19 MG     18    .060    9.25    143     9.329   6486      14     84     33     .057      .8     5    1.9   11   19.0
6 16 MG     19    .060    9.95    159    10.031   7847      16     95     41     .077     1.2     7    3.2   17   16.0
7  3 MG     18    .120   12.31   1117    12.449  18371      29    358    547     .113     3.2    40   61.8   77    3.0
8 16 MG     17    .060    9.51    209     9.588   7847      15     99     57     .077     1.2     8    4.4   17   16.0
9 C.T.      38    .060    7.70     86     7.801   4400      23     68     16     .143     3.3    10    2.3    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      1.0     6    5.1
1 IDLE      60    .060    9.45    132     9.576   2812      19     36     13     .232     4.4     8    3.0    0   16.5
2 16 MG     20    .060   10.06    134    10.142   7847      17     94     34     .077     1.3     7    2.7   17   16.0
3 10 MG     19    .070   10.94    338    11.031  11431      21    147    116     .147     3.1    22   17.1   41   10.0
4 16 MG     17    .060    9.91    167     9.988   7847      15    100     46     .077     1.2     8    3.5   17   16.0
5 19 MG     19    .060    9.53    142     9.611   6486      14     82     32     .057      .8     5    1.8   11   19.0
6 16 MG     19    .060   10.22    149    10.301   7847      16     92     38     .077     1.2     7    2.9   17   16.0
7  3 MG     19    .110   12.32   1122    12.451  18371      30    328    550     .113     3.4    37   62.1   77    3.0
8 16 MG     17    .060    8.89    190     8.968   7847      16    106     55     .077     1.2     8    4.2   17   16.0
9 C.T.      28    .060    7.77     85     7.860   4400      17     68     16     .143     2.4    10    2.3    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       .9     5    4.9
1 IDLE      60    .060    9.45    132     9.576   2812      19     36     13     .232     4.4     8    3.0    0   16.5
2 16 MG     25    .060   10.17    127    10.257   7847      21     93     32     .077     1.6     7    2.5   17   16.0
3 10 MG     20    .070   10.72    357    10.812  11431      23    150    125     .147     3.4    22   18.4   41   10.0
4 16 MG     19    .060    9.49    166     9.571   7847      17     99     45     .077     1.3     8    3.5   17   16.0
5 19 MG     20    .060    9.56    161     9.642   6486      15     82     36     .057      .8     5    2.0   11   19.0
6 16 MG     20    .060   10.60    173    10.682   7847      16     89     42     .077     1.2     7    3.2   17   16.0
7  3 MG     21    .110   12.40   1163    12.533  18371      33    326    566     .113     3.8    37   64.0   77    3.0
8 16 MG     47    .050    8.26    211     8.361   7847      48     95     66     .077     3.7     7    5.1   17   16.0
9 C.T.      30    .060    7.34     64     7.432   4400      19     72     13     .143     2.7    10    1.8    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      1.1     5    5.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------      1.0     6    5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------      1.0     5    5.0
FOUR CYCLE COMPOSITE -             HC- NDIR 0.35(     1.0) + 0.65(     1.0) =    1.020   GM/BHP HR
                                   CO- NDIR 0.35(     5.6) + 0.65(     5.4) =    5.484   GM/BHP HR
                                   NO2-NDIR 0.35(     5.4) + 0.65(     5.0) =    5.135   GM/BHP HR
                                                         CORRECTED NO2 =    5.525   GM/BHP HR
                                                                  BSFC =     .845   LB/BHP HR
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE       HC-FID   CO     CO2   NO-CL   CARBON   CONS.     HC     CO     NO2    FACT.  HC-FID   CO  NO2-CL  HP   VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE     807    .110    9.99    255    10.181   2812      22     61     23     .232     5.2    14    5.4    0   16.5
2 16 MG    116    .060   10.06    188    10.132   7847       9     94     48     .077      .7     7    3.7   17   16.0
3 10 MG    138    .060   11.18    450    11.254  11431      14    123    152     .147     2.1    18   22.3   41   10.0
4 16 MG     69    .060    9.98    230    10.047   7847       5     95     60     .077      .4     7    4.6   17   16.0
5 19 MG     48    .050    9.36    185     9.415   6486       3     70     42     .057      .2     4    2.4   11   19.0
6 16 MG     61    .050   10.03    180    10.086   7847       5     79     46     .077      .4     6    3.6   17   16.0
7  3 MG     70    .100   12.47   1187    12.577  18371      10    295    576     .113     1.2    33   65.0   77    3.0
8 16 MG     27    .060   10.14    225    10.203   7847       2     93     57     .077      .2     7    4.4   17   16.0
9 C.T.     409    .060    8.26     95     8.360   4400      21     64     17     .143     3.0     9    2.4    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       .6     5    5.6
1 IDLE     807    .110    9.99    255    10.181   2812      22     61     23     .232     5.2    14    5.4    0   16.5
2 16 MG     82    .060   10.11    120    10.178   7847       6     93     31     .077      .5     7    2.4   17   16.0
3 10 MG    117    .070   11.09    345    11.172  11431      12    145    117     .147     1.8    21   17.2   41   10.0
4 16 MG     69    .060    9.64    160     9.707   7847       6     98     43     .077      .4     8    3.3   17   16.0
5 19 MG     48    .060    9.25    140     9.315   6486       3     84     32     .057      .2     5    1.8   11   19.0
6 16 MG     69    .060    9.95    140    10.017   7847       5     95     36     .077      .4     7    2.8   17   16.0
7  3 MG     98    .120   12.31   1100    12.440  18371      14    358    539     .113     1.6    40   60.9   77    3.0
8 16 MG     48    .060    9.51    180     9.575   7847       4     99     49     .077      .3     8    3.8   17   16.0
9 C.T.     416    .060    7.70     80     7.802   4400      23     68     15     .143     3.4    10    2.1    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       .7     6    4.9
1 IDLE     640    .060    9.45     80     9.574   2812      19     36      8     .232     4.4     8    1.8    0   16.5
2 16 MG    116    .060   10.06    110    10.132   7847       9     94     28     .077      .7     7    2.2   17   16.0
3 10 MG    138    .070   10.94    335    11.024  11431      14    147    115     .147     2.1    22   17.0   41   10.0
4 16 MG     82    .060    9.91    155     9.978   7847       7    100     43     .077      .5     8    3.3   17   16.0
5 19 MG     61    .060    9.53    130     9.596   6486       4     82     29     .057      .2     5    1.7   11   19.0
6 16 MG     82    .060   10.22    130    10.288   7847       6     92     33     .077      .5     7    2.5   17   16.0
7  3 MG    111    .110   12.32   1100    12.441  18371      16    328    539     .113     1.9    37   60.9   77    3.0
8 16 MG     59    .060    8.89    190     8.956   7847       5    106     55     .077      .4     8    4.3   17   16.0
9 C.T.     349    .060    7.77     80     7.865   4400      19     68     15     .143     2.8    10    2.1    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       .7     5    4.7
1 IDLE     640    .060    9.45     80     9.574   2812      19     36      8     .232     4.4     8    1.8    0   16.5
2 16 MG    124    .060   10.17    110    10.242   7847       9     93     28     .077      .7     7    2.2   17   16.0
3 10 MG    144    .070   10.72    350    10.804  11431      15    150    123     .147     2.2    22   18.1   41   10.0
4 16 MG     75    .060    9.49    160     9.558   7847       6    100     44     .077      .5     8    3.4   17   16.0
5 19 MG     54    .060    9.56    140     9.625   6486       4     82     31     .057      .2     5    1.8   11   19.0
6 16 MG     69    .060   10.60    130    10.667   7847       5     89     32     .077      .4     7    2.4   17   16.0
7  3 MG    112    .110   12.40   1125    12.521  18371      16    326    548     .113     1.8    37   61.9   77    3.0
8 16 MG     47    .050    8.26    200     8.315   7847       4     95     63     .077      .3     7    4.8   17   16.0
9 C.T.     352    .060    7.34     88     7.435   4400      21     72     17     .143     3.0    10    2.5    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       .7     5    4.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------       .7     6    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------       .7     5    4.8
FOUR CYCLE COMPOSITE -             HC- FID  0.35(      .7) + 0.65(      .7) =     .661   GM/BHP HR
                                   CO- NDIR 0.35(     5.6) + 0.65(     5.5) =    5.489   GM/BHP HR
                                   NO2-CL   0.35(     5.2) + 0.65(     4.8) =    4.932   GM/BHP HR
                                                         CORRECTED NO2 =    5.307   GM/BHP HR
                                                                  BSFC =     .845   LB/BHP HR
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                         TABLE D-13. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 9-00  TEST-33  RUN-1  1972 STANDARD ENGINE   06-18-73       K =1.105      HUM =125.8  GM/LB
----------------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
                 HC      CO     CO2     NO   CARBON   CONS.      HC      CO     NO2   FACT.     HC      CO    NO2   HP   VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE          156   2.430   11.49    147   14.088    2449      29     853       8    .232      6.8    198    2.0    0   18.0
2 30 PCT T      108   1.290   13.11    669   14.517    9390      75    1686     143    .077      5.8    130   11.0   28   15.8
3 60 PCT T      111    .770   13.41   1900   14.300   13608     114    1480     600    .147     16.8    218   88.2   58    9.8
4 30 PCT T       95   1.360   13.13    750   14.593    9390      66    1768     160    .077      5.1    136   12.3   28   15.8
5 10 PCT T       88   1.920   13.05    290   15.065    6441      41    1658      41    .057      2.3     95    2.3   10   19.5
6 30 PCT T       94   1.300   13.17    728   14.572    9390      65    1692     156    .077      5.0    130   12.0   28   15.8
7 90 PCT T      107   1.990   12.97   1529   15.076   20140     154    5370     676    .113     17.4    607   76.4   86    2.9
8 30 PCT T       97   1.400   13.21    799   14.715    9390      67    1805     169    .077      5.1    139   13.0   28   15.8
9 C.T.         3338   2.730    7.17    112   13.505    2495     666    1019       7    .143     95.2    146    1.0    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      5.8     65    7.9
1 IDLE          156   2.430   11.49    147   14.088    2449      29     853       8    .232      6.8    198    2.0    0   18.0
2 30 PCT T      116   1.270   13.15    750   14.545    9390      81    1656     161    .077      6.2    128   12.4   28   15.8
3 60 PCT T      118    .710   13.49   1967   14.327   13608     121    1362     620    .147     17.8    200   91.2   58    9.8
4 30 PCT T      102   1.370   13.15    789   14.630    9390      71    1726     168    .077      5.4    133   12.9   28   15.8
5 10 PCT T       92   1.820   13.08    309   14.999    6441      43    1574      44    .057      2.4     90    2.5   10   19.5
6 30 PCT T      100   1.270   13.22    830   14.598    9390      69    1650     177    .077      5.3    127   13.6   28   15.8
7 90 PCT T      125   2.460   12.80   1505   15.395   20140     177    6501     654    .113     20.0    735   73.9   86    2.9
8 30 PCT T       99   1.460   13.18    777   14.747    9390      68    1878     164    .077      5.2    145   12.6   28   15.8
9 C.T.         3246   2.690    7.28    103   13.480    2495     659     987       6    .143     94.2    141     .9    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      5.9     69    8.1
1 IDLE          197   2.290   11.87    152   14.373    2449      36     788       9    .232      8.4    183    2.0    0   18.0
2 30 PCT T      120   1.410   13.08    767   14.620    9390      83    1829     164    .077      6.4    141   12.6   28   15.8
3 60 PCT T      123    .800   13.44   1967   14.373   13608     126    1530     618    .147     18.5    225   90.9   58    9.8
4 30 PCT T      104   1.320   13.17    863   14.602    9390      72    1715     184    .077      5.5    132   14.2   28   15.8
5 10 PCT T       94   1.810   13.05    311   14.962    6441      44    1574      44    .057      2.5     90    2.5   10   19.5
6 30 PCT T      102   1.380   13.10    770   14.590    9390      71    1794     165    .077      5.5    138   12.7   28   15.8
7 90 PCT T      127   2.450   12.76   1465   15.347   20140     180    6495     638    .113     20.3    734   72.1   86    2.9
8 30 PCT T      104   1.360   13.24    862   14.718    9390      72    1753     183    .077      5.5    135   14.1   28   15.8
9 C.T.         3246   2.600    7.31    108   13.416    2495     652     977       7    .143     93.2    140    1.0    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      6.0     70    8.1
1 IDLE          197   2.290   11.87    152   14.373    2449      36     788       9    .232      8.4    183    2.0    0   18.0
2 30 PCT T      134   1.180   13.12    779   14.446    9390      94    1549     168    .077      7.2    119   12.9   28   15.8
3 60 PCT T      129    .730   13.42   2035   14.289   13608     133    1404     643    .147     19.5    206   94.6   58    9.8
4 30 PCT T      112   1.330   13.16    819   14.611    9390      78    1727     174    .077      6.0    133   13.4   28   15.8
5 10 PCT T       97   1.540   13.08    324   14.725    6441      46    1361      47    .057      2.6     78    2.7   10   19.5
6 30 PCT T      104   1.270   13.16    767   14.542    9390      73    1656     164    .077      5.6    128   12.7   28   15.8
7 90 PCT T      128   2.340   12.86   1504   15.338   20140     182    6207     656    .113     20.5    701   74.1   86    2.9
8 30 PCT T      105   1.350   13.20    819   14.663    9390      73    1746     173    .077      5.6    134   13.3   28   15.8
9 C.T.         3376   2.490    7.23    104   13.366    2495     681     939       6    .143     97.3    134     .9    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      6.3     66    8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------      5.9     67    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------      6.1     68    8.1
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     5.9) + 0.65(     6.1) =    6.045   GM/BHP HR
                                    CO- NDIR 0.35(    67.1) + 0.65(    67.7) =   67.501   GM/BHP HR
                                    NO2-NDIR 0.35(     8.0) + 0.65(     8.1) =    8.085   GM/BHP HR
                                                          CORRECTED NO2 =    8.937   GM/BHP HR
                                                                   BSFC =     .677   LB/BHP HR
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MODE           CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
               HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.   HC-FID    CO  NO2-CL   HP   VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE         3082   2.430   11.49     88   14.228    2449      53     845       5    .232     12.3    196    1.2    0   18.0
2 30 PCT T     2040   1.290   13.11    663   14.604    9390     131    1675     142    .077     10.1    129   10.9   28   15.8
3 60 PCT T     2149    .770   13.41   1900   14.395   13608     203    1470     596    .147     29.9    216   87.7   58    9.8
4 30 PCT T     1928   1.360   13.13    688   14.683    9390     123    1757     146    .077      9.5    135   11.2   28   15.8
5 10 PCT T     1856   1.920   13.05    262   15.156    6441      79    1648      37    .057      4.5     94    2.1   10   19.5
6 30 PCT T     1871   1.300   13.17    713   14.657    9390     120    1682     152    .077      9.2    130   11.7   28   15.8
7 90 PCT T     2106   1.990   12.97   1513   15.171   20140     280    5337     667    .113     31.6    603   75.4   86    2.9
8 30 PCT T     2009   1.400   13.21    788   14.811    9390     127    1793     166    .077      9.8    138   12.8   28   15.8
9 C.T.        41949   2.730    7.17     47   14.095    2495     736     980       3    .143    105.3    140     .4    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      8.1     65    7.7
1 IDLE         3082   2.430   11.49     88   14.228    2449      53     845       5    .232     12.3    196    1.2    0   18.0
2 30 PCT T     2097   1.270   13.15    725   14.630    9390     135    1647     154    .077     10.4    127   11.9   28   15.8
3 60 PCT T     2036    .710   13.49   1950   14.404   13608     192    1355     612    .147     28.3    199   89.9   58    9.8
4 30 PCT T     1735   1.370   13.15    762   14.694    9390     111    1769     162    .077      8.5    136   12.4   28   15.8
5 10 PCT T     1536   1.820   13.08    288   15.054    6441      66    1573      41    .057      3.7     90    2.3   10   19.5
6 30 PCT T     1531   1.270   13.22    814   14.643    9390      98    1645     173    .077      7.6    127   13.3   28   15.8
7 90 PCT T     1940   2.460   12.80   1475   15.454   20140     253    6476     638    .113     28.6    732   72.1   86    2.9
8 30 PCT T     1612   1.460   13.18    763   14.801    9390     102    1871     161    .077      7.9    144   12.4   28   15.8
9 C.T.        44107   2.690    7.28     38   14.331    2495     768     928       2    .143    109.8    133     .3    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      7.9     68    7.8
1 IDLE         1979   2.290   11.87    100   14.358    2449      34     789       6    .232      7.8    183    1.3    0   18.0
2 30 PCT T     1361   1.410   13.08    750   14.626    9390      87    1829     160    .077      6.7    141   12.3   28   15.8
3 60 PCT T     1188    .800   13.44   2000   14.359   13608     113    1531     629    .147     16.6    225   92.5   58    9.8
4 30 PCT T     1077   1.320   13.17    850   14.598    9390      69    1715     182    .077      5.3    132   14.0   28   15.8
5 10 PCT T     1052   1.810   13.05    275   14.965    6441      45    1574      39    .057      2.6     90    2.2   10   19.5
6 30 PCT T      964   1.380   13.10    763   14.576    9390      62    1796     163    .077      4.8    138   12.6   28   15.8
7 90 PCT T     1169   2.450   12.76   1450   15.327   20140     154    6503     633    .113     17.4    735   71.6   86    2.9
8 30 PCT T     1305   1.360   13.24    838   14.731    9390      83    1751     177    .077      6.4    135   13.7   28   15.8
9 C.T.        36680   2.600    7.31     52   13.578    2495     674     965       3    .143     96.4    138     .5    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      5.9     70    8.0
1 IDLE         1979   2.290   11.87    100   14.358    2449      34     789       6    .232      7.8    183    1.3    0   18.0
2 30 PCT T     1557   1.180   13.12    763   14.456    9390     101    1548     165    .077      7.8    119   12.7   28   15.8
3 60 PCT T     1187    .730   13.42   2025   14.264   13608     113    1406     641    .147     16.6    207   94.3   58    9.8
4 30 PCT T     1162   1.330   13.16    813   14.606    9390      75    1727     174    .077      5.8    133   13.4   28   15.8
5 10 PCT T     1050   1.540   13.08    300   14.725    6441      46    1361      44    .057      2.6     78    2.5   10   19.5
6 30 PCT T      992   1.270   13.16    763   14.529    9390      64    1658     164    .077      4.9    128   12.6   28   15.8
7 90 PCT T     1283   2.340   12.86   1500   15.328   20140     169    6211     654    .113     19.1    702   73.9   86    2.9
8 30 PCT T     1447   1.350   13.20    800   14.695    9390      92    1743     170    .077      7.1    134   13.1   28   15.8
9 C.T.        37493   2.490    7.23     50   13.469    2495     695     932       3    .143     99.3    133     .4    0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------      6.2     66    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------      8.0     66    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------      6.1     68    8.1
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     8.0) + 0.65(     6.1) =    6.739   GM/BHP HR
                                    CO- NDIR 0.35(    66.5) + 0.65(    67.7) =   67.281   GM/BHP HR
                                    NO2-CL   0.35(     7.8) + 0.65(     8.1) =    7.967   GM/BHP HR
                                                          CORRECTED NO2 =    8.807   GM/BHP HR
                                                                   BSFC =     .677   LB/BHP HR
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                   TABLE D-14. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-00  TEST 33  RUN-2  1972 STANDARD ENGINE   06-18-73      K =1.101      HUM =121.9  GR/LB
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                 CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR           MAN.
MODE              HC      CO     CO2     NO  CARBON   CONS.      HC      CO    NO2    FACT.    HC       CO    NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE            19    .750   11.08    132  11.851    2449       4     313      4    .232     1.0      73    2.1     0    18.0
2 30 PCT T        20    .440   11.40    669  11.862    9390      17     704    176    .077     1.3      54   13.5    28    15.8
3 60 PCT T       122    .900   13.73   1887  14.762   13608     121    1676    578    .147    17.9     246   84.9    58     9.8
4 30 PCT T       106   1.390   13.44    784  14.944    9390      72    1764    164    .077     5.5     136   12.6    28    15.8
5 10 PCT T        94   1.730   13.38    316  15.212    6441      43    1480     44    .057     2.5      84    2.5    10    19.5
6 30 PCT T       101   1.210   13.46    782  14.779    9390      69    1553    165    .077     5.3     120   12.7    28    15.8
7 90 PCT T       132   2.900   12.92   1391  15.964   20190     180    7391    583    .113    20.3     835   65.8    86     2.4
8 30 PCT T       105   1.350   13.52    861  14.983    9390      71    1709    179    .077     5.5     132   13.8    28    15.8
9 C.T.          2790   2.500    7.26    107  12.714    2495     580     991      7    .143    83.0     142    1.0     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       5.2      66    7.6
1 IDLE            19    .750   11.08    132  11.851    2449       4     313      4    .232     1.0      73    2.1     0    18.0
2 30 PCT T       127   1.240   13.43    774  14.807    9390      87    1588    163    .077     6.7     122   12.5    28    15.8
3 60 PCT T       128    .830   13.73   1958  14.698   13608     128    1552    602    .147    18.8     228   88.5    58     9.8
4 30 PCT T       107   1.250   13.41    821  14.776    9390      73    1605    173    .077     5.7     124   13.3    28    15.8
5 10 PCT T        92   1.670   13.39    333  15.159    6441      42    1433     47    .057     2.4      82    2.7    10    19.5
6 30 PCT T       103   1.240   13.42    829  14.771    9390      71    1592    175    .077     5.4     123   13.5    28    15.8
7 90 PCT T       121   1.850   13.37   1538  15.351   20190     171    4903    670    .113    19.4     554   75.7    86     2.4
8 30 PCT T       102   1.430   13.47    808  15.010    9390      69    1807    168    .077     5.3     139   12.9    28    15.8
9 C.T.          2773   2.500    7.27    110  12.765    2495     585     987      7    .143    83.7     141    1.0     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       5.4      58    8.1
1 IDLE           201   2.330   12.12    169  14.667    2449      36     786      9    .232     8.4     182    2.1     0    18.0
2 30 PCT T       129   1.270   13.40    770  14.809    9390      88    1627    162    .077     6.8     125   12.5    28    15.8
3 60 PCT T       141    .810   13.82   1942  14.771   13608     130    1507    594    .147    19.2     222   87.3    58     9.8
4 30 PCT T       109   1.330   13.44    826  14.888    9390      74    1694    173    .077     5.7     130   13.3    28    15.8
5 10 PCT T       102   1.760   13.40    329  15.270    6441      46    1500     46    .057     2.6      85    2.6    10    19.5
6 30 PCT T       109   1.240   13.43    791  14.787    9390      74    1591    167    .077     5.7     122   12.8    28    15.8
7 90 PCT T       129   2.120   13.20   1501  15.454   20190     175    5581    649    .113    19.7     631   73.4    86     2.4
8 30 PCT T       108   1.280   13.54    845  14.937    9390      73    1625    176    .077     5.6     125   13.6    28    15.8
9 C.T.          2790   2.480    7.30    119  12.739    2495     580     981      8    .143    82.9     140    1.1     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       5.7      64    7.9
1 IDLE           201   2.330   12.12    169  14.667    2449      36     786      9    .232     8.4     182    2.1     0    18.0
2 30 PCT T       134   1.290   13.38    767  14.815    9390      92    1652    161    .077     7.1     127   12.4    28    15.8
3 60 PCT T       133    .820   13.71   1957  14.674   13608     133    1536    603    .147    19.6     226   88.6    58     9.8
4 30 PCT T       111   1.320   13.46    859  14.900    9390      76    1680    180    .077     5.8     129   13.8    28    15.8
5 10 PCT T        99   1.690   13.36    318  15.157    6441      45    1451     45    .057     2.6      83    2.6    10    19.5
6 30 PCT T       104   1.220   13.49    777  14.822    9390      71    1561    163    .077     5.5     120   12.6    28    15.8
7 90 PCT T       107   1.740   13.30   1553  15.156   20190     159    4671    685    .113    17.9     528   77.4    86     2.4
8 30 PCT T       105   1.330   13.50    946  14.943    9390      71    1680    176    .077     5.5     130   13.6    28    15.8
9 C.T.          2650   2.500    7.48    127  12.892    2495     556     981      8    .143    79.5     140    1.2     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       5.5      60    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       5.3      62    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       5.6      62    8.0
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     5.3) + 0.65(     5.6) =    5.477   GM/BHP HR
                                        CO- NDIR 0.35(    61.8) + 0.65(    62.2) =   62.065   GM/BHP HR
                                        NO2-NDIR 0.35(     7.8) + 0.65(     8.0) =    7.962   GM/BHP HR
                                                                CORRECTED NO2 =    8.768   GM/BHP HR
                                                                         BSFC =     .677   LB/BHP HR
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                 CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR           MAN.
MODE           HC-FID     CO     CO2  NO-CL  CARBON   CONS.      HC      CO    NO2    FACT.  HC-FID     CO  NO2-CL  HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE          2857    .750   11.08     56  12.116    2449      58     306      4    .232    13.4      71     .9     0    18.0
2 30 PCT T      1969    .440   11.40    600  12.037    9390     154     693    155    .077    11.8      53   12.0    28    15.8
3 60 PCT T      2072    .900   13.73   1825  14.837   13608     190    1667    556    .147    27.9     245   81.7    58     9.8
4 30 PCT T      1819   1.390   13.44    737  15.012    9390     114    1756    153    .077     8.8     135   11.8    28    15.8
5 10 PCT T      1681   1.730   13.38    243  15.278    6441      71    1473     34    .057     4.0      84    1.9    10    19.5
6 30 PCT T      1760   1.210   13.46    712  14.846    9390     111    1546    150    .077     8.6     119   11.5    28    15.8
7 90 PCT T      2350   2.900   12.92   1300  16.055   20190     295    7348    541    .113    33.3     830   61.2    86     2.4
8 30 PCT T      1905   1.350   13.52    781  15.061    9390     119    1700    162    .077     9.1     131   12.4    28    15.8
9 C.T.         36197   2.500    7.26     37  13.380    2495     675     942      2    .143    96.5     135     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       7.7      65    7.0
1 IDLE          2857    .750   11.08     56  12.116    2449      58     306      4    .232    13.4      71     .9     0    18.0
2 30 PCT T      2158   1.240   13.43    700  14.886    9390     136    1580    147    .077    10.5     122   11.3    28    15.8
3 60 PCT T      2213    .830   13.73   1900  14.781   13608     204    1544    581    .147    29.9     227   85.4    58     9.8
4 30 PCT T      1999   1.250   13.41    750  14.860    9390     126    1596    157    .077     9.7     123   12.1    28    15.8
5 10 PCT T      1777   1.670   13.39    250  15.238    6441      75    1426     35    .057     4.3      81    2.0    10    19.5
6 30 PCT T      1931   1.240   13.42    731  14.853    9390     122    1584    153    .077     9.4     122   11.8    28    15.8
7 90 PCT T      2282   1.850   13.37   1475  15.448   20190     297    4872    638    .113    33.6     551   72.1    86     2.4
8 30 PCT T      2048   1.430   13.47    737  15.105    9390     127    1796    152    .077     9.8     138   11.7    28    15.8
9 C.T.         43615   2.500    7.27     30  14.131    2495     770     892      2    .143   110.1     127     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       8.4      57    7.5
1 IDLE          3809   2.330   12.12     75  14.831    2449      63     777      4    .232    14.6     180    1.0     0    18.0
2 30 PCT T      2215   1.270   13.40    687  14.891    9390     140    1618    144    .077    10.8     125   11.1    28    15.8
3 60 PCT T      2327    .810   13.82   1863  14.863   13608     213    1498    566    .147    31.3     220   83.2    58     9.8
4 30 PCT T      1989   1.330   13.44    750  14.969    9390     125    1685    156    .077     9.6     130   12.0    28    15.8
5 10 PCT T      1938   1.760   13.40    243  15.354    6441      81    1491     34    .057     4.6      85    1.9    10    19.5
6 30 PCT T      1931   1.240   13.43    725  14.863    9390     122    1582    152    .077     9.4     122   11.7    28    15.8
7 90 PCT T      2226   2.120   13.20   1925  15.543   20190     288    5549    613    .113    32.6     627   69.3    86     2.4
8 30 PCT T      1990   1.280   13.54    775  15.019    9390     124    1617    161    .077     9.6     124   12.4    28    15.8
9 C.T.         44491   2.480    7.30     43  14.229    2495     780     878      3    .143   111.6     126     .4     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       8.5      63    7.4
1 IDLE          3809   2.330   12.12     75  14.831    2449      63     777      4    .232    14.6     180    1.0     0    18.0
2 30 PCT T      2385   1.290   13.38    695  14.908    9390     150    1641    145    .077    11.6     126   11.2    28    15.8
3 60 PCT T      2496    .820   13.71   1881  14.780   13608     230    1525    575    .147    33.8     224   84.5    58     9.8
4 30 PCT T      2103   1.320   13.46    787  14.990    9390     132    1670    164    .077    10.1     129   12.6    28    15.8
5 10 PCT T      1937   1.690   13.36    250  15.244    6441      82    1442     35    .057     4.7      82    2.0    10    19.5
6 30 PCT T      1988   1.220   13.49    720  14.909    9390     125    1552    151    .077     9.6     120   11.6    28    15.8
7 90 PCT T      1993   1.740   13.30   1480  15.239   20190     263    4645    649    .113    29.8     525   73.4    86     2.4
8 30 PCT T      2097   1.330   13.50    787  15.035    9390     128    1678    163    .077     9.8     129   12.6    28    15.8
9 C.T.         46319   2.500    7.48     40  14.611    2495     791     862      2    .143   113.1     123     .3     0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       8.6      59    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       8.1      61    7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       8.5      61    7.5
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     8.1) + 0.65(     8.5) =    8.376   GM/BHP HR
                                        CO- NDIR 0.35(    61.1) + 0.65(    61.3) =   61.193   GM/BHP HR
                                        NO2-CL   0.35(     7.3) + 0.65(     7.5) =    7.407   GM/BHP HR
                                                                CORRECTED NO2 =    8.157   GM/BHP HR
                                                                         BSFC =     .677   LB/BHP HR
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                    TABLE D-15. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-00  TEST-33  RUN-3  1972 STANDARD ENGINE   06-18-73        K =1.098      HUM =118.9  GR/LB
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                 CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE             HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.   HC       CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE           147   2.000   11.90    133   14.059    2449      28     704      8    .232     6.4     163     1.8     0    18.0
2 30 PCT T       116   1.250   13.43    686   14.805    9390      79    1601    144    .077     6.1     123    11.1    28    15.8
3 60 PCT T       123    .850   13.90   1923   14.883   13608     121    1570    584    .147    17.9     231    85.8    58     9.8
4 30 PCT T       117   1.270   13.53    781   14.926    9390      79    1614    163    .077     6.1     124    12.6    28    15.8
5 10 PCT T       102   1.830   13.52    290   15.460    6991      46    1540     40    .057     2.6      88     2.3    10    19.5
6 30 PCT T       106   1.230   13.55    754   14.894    9390      72    1566    158    .077     5.6     121    12.2    28    15.8
7 90 PCT T       119   1.990   13.40   1498   15.519   20190     167    5217    645    .113    18.8     590    72.9    86     2.4
8 30 PCT T       106   1.450   13.63    743   15.194    9390      71    1810    163    .077     5.4     139    12.5    28    15.8
9 C.T.          2688   2.580    7.33    106   12.813    2495     565    1015      7    .143    80.8     145     1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.4      63     7.7
1 IDLE           147   2.000   11.90    133   14.059    2449      28     704      8    .232     6.4     163     1.8     0    18.0
2 30 PCT T       123   1.250   13.55    774   14.933    9390      84    1588    162    .077     6.4     122    12.4    28    15.8
3 60 PCT T       127    .870   13.86   1950   14.867   13608     126    1604    593    .147    18.5     236    87.1    58     9.8
4 30 PCT T       107   1.330   13.57    798   15.016    9390      72    1680    166    .077     5.6     129    12.8    28    15.8
5 10 PCT T        95   1.510   13.51    323   15.123    6991      44    1299     46    .057     2.5      74     2.6    10    19.5
6 30 PCT T       105   1.290   13.62    805   15.023    9390      71    1629    167    .077     5.5     125    12.9    28    15.8
7 90 PCT T       121   2.030   13.36   1497   15.521   20190     170    5321    645    .113    19.2     601    72.9    86     2.4
8 30 PCT T       108   1.400   13.58    815   15.097    9390      73    1759    168    .077     5.6     135    13.0    28    15.8
9 C.T.          2710   2.190    7.50     41   12.617    2495     579     875      6    .143    82.8     125      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.5      62     7.8
1 IDLE           174   1.800   12.69    132   14.678    2449      31     607      7    .232     7.3     141     1.7     0    18.0
2 30 PCT T       125   1.250   13.82    764   15.205    9390      83    1559    158    .077     6.4     120    12.1    28    15.8
3 60 PCT T       128    .820   14.04   1982   14.998   13608     125    1503    597    .147    18.4     221    87.8    58     9.8
4 30 PCT T       107   1.280   13.76    836   15.156    9390      72    1602    172    .077     5.5     123    13.2    28    15.8
5 10 PCT T        95   1.650   13.72    306   15.473    6991      43    1387     42    .057     2.4      79     2.4    10    19.5
6 30 PCT T       105   1.250   13.79    790   15.153    9390      70    1565    163    .077     5.4     120    12.5    28    15.8
7 90 PCT T       107   1.800   13.54   1531   15.456   20190     151    4738    662    .113    17.0     535    74.8    86     2.4
8 30 PCT T       104   1.330   13.77    856   15.212    9390      69    1658    175    .077     5.3     128    13.5    28    15.8
9 C.T.          2919   2.160    7.67    101   12.983    2495     606     839      6    .143    86.6     120      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.6      58     7.9
1 IDLE           174   1.800   12.69    132   14.674    2449      31     607      7    .232     7.3     141     1.7     0    18.0
2 30 PCT T       131   1.370   13.72    771   15.231    9390      87    1706    158    .077     6.7     131    12.2    28    15.8
3 60 PCT T       137    .830   14.13   1965   15.108   13608     133    1510    588    .147    19.6     222    86.4    58     9.8
4 30 PCT T       107   1.340   13.71    810   15.166    9390      72    1676    167    .077     5.5     129    12.8    28    15.8
5 10 PCT T        97   1.500   13.72    304   15.325    6991      44    1274     42    .057     2.5      73     2.4    10    19.5
6 30 PCT T       109   1.350   13.69    831   15.158    9390      73    1689    171    .077     5.6     130    13.2    28    15.8
7 90 PCT T       135   2.610   13.24   1436   15.996   20190     184    6638    600    .113    20.7     750    67.8    86     2.4
8 30 PCT T       108   1.320   13.78    884   15.217    9390      72    1645    181    .077     5.5     127    13.9    28    15.8
9 C.T.          2936   2.120    7.61     44   12.901    2495     613     826      6    .143    87.7     118      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.8      66     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     5.5      62     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     5.7      62     7.8
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     5.5) + 0.65(     5.7) =    5.640   GM/BHP HR
                                       CO- NDIR 0.35(    62.4) + 0.65(    61.8) =   62.011   GM/BHP HR
                                       NO2-NDIR 0.35(     7.8) + 0.65(     7.8) =    7.799   GM/BHP HR
                                                            CORRECTED NO2 =    8.555   GM/BHP HR
                                                                     BSFC =     .677   LB/BHP HR
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                 CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE            HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          2793   2.000   11.90     75   14.179    2449      48     698      4    .232    11.2     162     1.0     0    18.0
2 30 PCT T      2158   1.250   13.43    613   14.896    9390     136    1592    128    .077    10.5     123     9.9    28    15.8
3 60 PCT T      2216    .850   13.90   1638   14.972   13608     201    1561    555    .147    29.6     229    81.5    58     9.8
4 30 PCT T      2046   1.270   13.53    738   15.005    9390     128    1605    153    .077     9.9     124    11.8    28    15.8
5 10 PCT T      1770   1.830   13.52    250   15.527    6991      73    1533     34    .057     4.2      87     2.0    10    19.5
6 30 PCT T      1932   1.230   13.55    725   14.973    9390     121    1558    151    .077     9.3     120    11.6    28    15.8
7 90 PCT T      2056   1.990   13.40   1450   15.596   20190     266    5191    622    .113    30.0     587    70.2    86     2.4
8 30 PCT T      1937   1.450   13.63    763   15.274    9390     119    1801    156    .077     9.2     139    12.0    28    15.8
9 C.T.         38427   2.580    7.33     52   13.753    2495     697     945      3    .143    99.7     135      .4     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     7.7      62     7.3
1 IDLE          2793   2.000   11.90     75   14.179    2449      48     698      4    .232    11.2     162     1.0     0    18.0
2 30 PCT T      2245   1.250   13.55    725   15.025    9390     140    1578    150    .077    10.8     122    11.6    28    15.8
3 60 PCT T      2273    .870   13.86   1942   14.957   13608     207    1599    587    .147    30.4     235    86.2    58     9.8
4 30 PCT T      1963   1.330   13.57    775   15.096    9390     122    1671    160    .077     9.4     129    12.3    28    15.8
5 10 PCT T      1765   1.510   13.51    275   15.197    6991      75    1293     39    .057     4.3      74     2.2    10    19.5
6 30 PCT T      1934   1.290   13.62    762   15.103    9390     120    1620    157    .077     9.3     125    12.1    28    15.8
7 90 PCT T      2256   2.030   13.36   1475   15.616   20190     291    5285    632    .113    32.9     598    71.4    86     2.4
8 30 PCT T      2135   1.400   13.58    775   15.193    9390     132    1748    159    .077    10.2     135    12.2    28    15.8
9 C.T.         49251   2.190    7.50     57   14.615    2495     841     755      3    .143   120.2     108      .5     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     8.7      61     7.6
1 IDLE          3395   1.800   12.69    100   14.825    2449      55     601      5    .232    12.8     139     1.3     0    18.0
2 30 PCT T      2369   1.250   13.82    725   15.306    9390     145    1549    148    .077    11.2     119    11.4    28    15.8
3 60 PCT T      2496    .820   14.04   1950   15.105   13608     220    1492    583    .147    32.4     219    85.7    58     9.8
4 30 PCT T      2107   1.280   13.76    825   15.251    9390     130    1592    169    .077    10.0     123    13.0    28    15.8
5 10 PCT T      1942   1.650   13.72    275   15.564    6991      80    1379     38    .057     4.6      79     2.2    10    19.5
6 30 PCT T      2079   1.250   13.79    762   15.248    9390     128    1555    156    .077     9.9     120    12.0    28    15.8
7 90 PCT T      2027   1.800   13.54   1512   15.543   20190     263    4711    650    .113    29.7     532    73.5    86     2.4
8 30 PCT T      2108   1.330   13.77    825   15.311    9390     129    1648    168    .077    10.0     127    12.9    28    15.8
9 C.T.         46255   2.160    7.67     70   14.456    2495     798     753      4    .143   114.2     108      .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     8.5      57     7.7
1 IDLE          3395   1.800   12.69    100   14.825    2449      55     601      5    .232    12.8     139     1.3     0    18.0
2 30 PCT T      2507   1.370   13.72    725   15.341    9390     153    1694    147    .077    11.8     130    11.3    28    15.8
3 60 PCT T      2504    .830   14.13   1975   15.210   13608     224    1500    587    .147    32.9     220    86.2    58     9.8
4 30 PCT T      2051   1.340   13.71    775   15.255    9390     126    1666    158    .077     9.7     128    12.2    28    15.8
5 10 PCT T      1939   1.500   13.72    275   15.414    6991      81    1266     38    .057     4.6      72     2.2    10    19.5
6 30 PCT T      2079   1.350   13.69    800   15.248    9390     128    1679    164    .077     9.9     129    12.6    28    15.8
7 90 PCT T      2637   2.610   13.24   1400   16.114   20190     330    6590    581    .113    37.2     745    65.6    86     2.4
8 30 PCT T      2137   1.320   13.78    850   15.314    9390     131    1635    173    .077    10.1     126    13.3    28    15.8
9 C.T.         45344   2.120    7.61     65   14.264    2495     793     749      4    .143   113.4     107      .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     8.8      65     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     8.2      62     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     8.7      61     7.6
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     8.2) + 0.65(     8.7) =    8.496   GM/BHP HR
                                       CO- NDIR 0.35(    61.5) + 0.65(    61.0) =   61.189   GM/BHP HR
                                       NO2-CL   0.35(     7.4) + 0.65(     7.6) =    7.530   GM/BHP HR
                                                            CORRECTED NO2 =    8.266   GM/BHP HR
                                                                     BSFC =     .677   LB/BHP HR
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                     TABLE D-16. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-0   TEST 43  RUN-1   1973 CALIF ENGINE     06-28-73        K =1.099       HUM =120.1  GR/LB
---------------------------------------------------------------------------------------------------------------
                  CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
MODE             HC      CO     CO2     NO     CARBON   CONS.      HC      CO     NO2    FACT.    HC        CO      NO2     HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE          956   1.970    9.67    102    12.672    2678      218     891      7    .232     50.6      195      1.7     0     17.2
2 30 PCT T      300    .880   12.66    293    13.869    9985      233    1280     70    .077     18.0       99      5.4    29     13.3
3 60 PCT T      108    .670   13.03    711    13.817   15160      128    1485    259    .147     18.8      218     38.1    59      7.3
4 30 PCT T       97    .690   12.80    318    13.595    9985       77    1024     78    .077      5.9       79      6.0    29     13.3
5 10 PCT T       87   1.050   12.69    306    13.784    6128       42     943     45    .057      2.4       54      2.6    10     19.1
6 30 PCT T       87    .650   12.79    345    13.534    9928       69     963     84    .077      5.3       74      6.5    29     13.3
7 90 PCT T      127   2.620   12.23   1376    14.987   20607      189    7277    628    .113     21.3      822     71.0    87      2.4
8 30 PCT T       84    .810   12.85    355    13.751    9985       66    1188     86    .077      5.1       91      6.6    29     13.3
9 C.T.           83   1.630   12.59    155    14.310    4766       30    1097     17    .143      4.3      157      2.5     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      4.7       69      5.0
1 IDLE          956   1.970    9.67    102    12.672    2678      218     891      7    .232     50.6      195      1.7     0     17.2
2 30 PCT T      121    .680   12.88    328    13.691    9985       95    1002     79    .077      7.3       77      6.1    29     13.3
3 60 PCT T      100    .730   13.18    743    14.018   15160      117    1595    267    .147     17.2      234     39.2    59      7.3
4 30 PCT T       87    .650   12.86    360    13.604    9985       69     964     88    .077      5.3       74      6.8    29     13.3
5 10 PCT T       72    .820   12.76    291    13.658    6128       35     743     43    .057      2.0       42      2.5    10     19.1
6 30 PCT T       79    .620   12.88    339    13.585    9928       62     915     82    .077      4.8       70      6.3    29     13.3
7 90 PCT T      112   1.990   12.50   1545    14.611   20607      171    5669    723    .113     19.3      641     81.7    87      2.4
8 30 PCT T       81    .760   12.89    362    13.737    9985       64    1116     87    .077      4.9       86      6.7    29     13.3
9 C.T.           87   1.710   12.72    137    14.524    4766       31    1133     15    .143      4.4      162      2.1     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      4.1       56      5.6
1 IDLE          526   1.990   10.84    121    13.398    2678      114     803      8    .232     26.3      186      1.9     0     17.2
2 30 PCT T      123    .700   12.96    329    13.793    9985       96    1029     79    .077      7.4       79      6.1    29     13.3
3 60 PCT T      104    .720   13.30    795    14.132   15160      120    1560    283    .147     17.7      229     41.6    59      7.3
4 30 PCT T       88    .770   12.94    355    13.805    9985       69    1125     85    .077      5.3       87      6.6    29     13.3
5 10 PCT T       74    .730   12.90    296    13.710    6128       36     659     44    .057      2.0       38      2.5    10     19.1
6 30 PCT T       79    .580   13.02    340    13.685    9928       62     850     82    .077      4.8       65      6.3    29     13.3
7 90 PCT T      109   1.700   12.70   1570    14.512   20607      159    4876    740    .113     18.0      551     83.6    87      2.4
8 30 PCT T       76    .660   13.08    379    13.822    9985       59     963     91    .077      4.6       74      7.0    29     13.3
9 C.T.           94   1.520   12.59    159    14.212    4766       34    1030     18    .143      4.9      147      2.5     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      3.2       52      5.6
1 IDLE          526   1.990   10.84    121    13.398    2678      114     803      8    .232     26.3      186      1.9     0     17.2
2 30 PCT T      116    .720   12.93    329    13.775    9985       91    1054     79    .077      7.0       81      6.1    29     13.3
3 60 PCT T      101    .850   13.26    766    14.209   15160      116    1832    271    .147     17.1      269     39.9    59      7.3
4 30 PCT T       83    .660   12.99    370    13.740    9985       65     969     89    .077      5.0       75      6.9    29     13.3
5 10 PCT T       71    .620   12.95    311    13.647    6128       34     562     46    .057      2.0       32      2.6    10     19.1
6 30 PCT T       81    .600   12.95    353    13.637    9928       64     882     85    .077      4.9       68      6.6    29     13.3
7 90 PCT T      106   1.720   12.71   1646    14.599   20607      162    4923    774    .113     18.3      556     87.5    87      2.4
8 30 PCT T       75    .660   13.11    374    13.851    9985       58     961     90    .077      4.5       74      6.9    29     13.3
9 C.T.          117   1.740   12.95    152    14.316    4766       42    1170     17    .143      6.0      167      2.4     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      3.2       54      5.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------      4.4       60      5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------      3.2       53      5.7
FOUR CYCLE COMPOSITE -                      HC- NDIR 0.35(     4.4) + 0.65(     3.2) =    3.652   GM/BHP HR
                                            CO- NDIR 0.35(    60.1) + 0.65(    52.8) =   55.351   GM/BHP HR
                                            NO2-NDIR 0.35(     5.2) + 0.65(     5.7) =    5.519   GM/BHP HR
                                                              CORRECTED NO2 =    6.067   GM/BHP HR
                                                                       BSFC =     .729   LB/BHP HR


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                  CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
MODE           HC-FID    CO     CO2   NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID      CO   NO2-CL   HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE        13292   1.970    9.67     73    12.969    2678      274     822      5    .232     63.7      191      1.2     0     17.2
2 30 PCT T     1987    .880   12.66    260    13.739    9985      144    1292     63    .077     11.1       99      4.8    29     13.3
3 60 PCT T     1820    .670   13.03    675    13.882   15160      199    1478    245    .147     29.2      217     36.0    59      7.3
4 30 PCT T     1715    .690   12.80    295    13.662    9985      125    1019     72    .077      9.7       78      5.5    29     13.3
5 10 PCT T     1465   1.050   12.69    260    13.836    6128       65     939     38    .057      3.7       54      2.2    10     19.1
6 30 PCT T     1647    .650   12.79    300    13.605    9928      120     958     73    .077      9.3       74      5.6    29     13.3
7 90 PCT T     2630   2.620   12.23   1312    15.113   20607      359    7216    594    .113     40.5      815     67.1    87      2.4
8 30 PCT T     1661    .810   12.85    325    13.826    9985      120    1182     78    .077      9.2       91      6.0    29     13.3
9 C.T.         1318   1.630   12.59    362    14.352    4766       44    1093     40    .143      6.3      156      5.7     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      6.5       63      4.8
1 IDLE        13292   1.970    9.67     73    12.969    2678      274     822      5    .232     63.7      191      1.2     0     17.2
2 30 PCT T     1913    .680   12.88    295    13.751    9985      139     997     71    .077     10.7       77      5.5    29     13.3
3 60 PCT T     1919    .730   13.18    710    14.102   15160      206    1585    253    .147     30.3      233     37.3    59      7.3
4 30 PCT T     1659    .650   12.86    320    13.676    9985      121     959     78    .077      9.3       74      6.0    29     13.3
5 10 PCT T     1351    .820   12.76    265    13.713    6128       60     740     39    .057      3.4       42      2.2    10     19.1
6 30 PCT T     1575    .620   12.88    305    13.657    9928      114     910     74    .077      8.8       70      5.7    29     13.3
7 90 PCT T     2268   1.990   12.50   1487    14.717   20607      318    5629    691    .113     35.9      636     78.1    87      2.4
8 30 PCT T     1633    .760   12.89    350    13.813    9985      118    1110     84    .077      9.1       85      6.5    29     13.3
9 C.T.         1369   1.710   12.72    112    14.567    4766       45    1130     12    .143      6.4      162      1.7     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      6.3       56      5.1
1 IDLE         6712   1.990   10.84     85    13.501    2678      133     797      6    .232     30.9      185      1.3     0     17.2
2 30 PCT T     1915    .700   12.96    295    13.851    9985      138    1019     71    .077     10.6       78      5.4    29     13.3
3 60 PCT T     1869    .720   13.30    735    14.206   15160      199    1552    260    .147     29.2      228     38.3    59      7.3
4 30 PCT T     1634    .770   12.94    325    13.873    9985      118    1119     78    .077      9.1       86      6.0    29     13.3
5 10 PCT T     1351    .730   12.90    270    13.765    6128       60     656     40    .057      3.4       37      2.3    10     19.1
6 30 PCT T     1576    .580   13.02    310    13.758    9928      114     845     74    .077      8.8       65      5.7    29     13.3
7 90 PCT T     2096   1.700   12.70   1525    14.610   20607      296    4844    714    .113     33.4      547     80.7    87      2.4
8 30 PCT T     1578    .660   13.08    350    13.898    9985      113     958     83    .077      8.7       74      6.4    29     13.3
9 C.T.         1215   1.520   12.59    150    14.232    4766       41    1028     17    .143      5.8      147      2.4     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      5.0       52      6.3
1 IDLE         6712   1.990   10.84     85    13.501    2678      133     797      6    .232     30.9      185      1.3     0     17.2
2 30 PCT T     2140    .720   12.93    295    13.964    9985      154    1047     71    .077     11.9       81      5.4    29     13.3
3 60 PCT T     1950    .850   13.25    720    14.295   15160      207    1821    254    .147     30.4      268     37.3    59      7.3
4 30 PCT T     1577    .660   12.99    335    13.806    9985      114     964     80    .077      8.8       74      6.2    29     13.3
5 10 PCT T     1351    .620   12.95    285    13.705    6128       60     560     42    .057      3.4       32      2.4    10     19.1
6 30 PCT T     1547    .600   12.95    330    13.705    9928      112     878     79    .077      8.6       68      6.1    29     13.3
7 90 PCT T     2154   1.720   12.71   1600    14.695   20607      303    4889    747    .113     34.2      552     84.5    87      2.4
8 30 PCT T     1522    .660   13.11    337    13.922    9985      109     956     80    .077      8.4       74      6.2    29     13.3
9 C.T.         1629   1.740   12.95    108    14.353    4766       54    1167     12    .143      7.7      167      1.7     0     21.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      5.1       53      5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------      6.4       60      5.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------      5.1       53      5.3
FOUR CYCLE COMPOSITE -                      HC- FID  0.35(     6.4) + 0.65(     5.1) =    5.538   GM/BHP HR
                                            CO- NDIR 0.35(    59.6) + 0.65(    52.5) =   54.989   GM/BHP HR
                                            NO2-CL   0.35(     5.0) + 0.65(     5.3) =    5.202   GM/BHP HR
                                                              CORRECTED NO2 =    5.718   GM/BHP HR
                                                                       BSFC =     .729   LB/BHP HR
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TABLE D-17. MASS EMISSIONS BY NINE-MODE EPA

ENGINE 9-U TEST 93 RUN-2 1973 CALIF ENGINE 06-28-73 K =1.091 HUM =114.2 GR/LB

	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
MODE	HC	CO	CO_2	NO	CARBON	CONS.	HC	CO	NO_2	FACT.	HC	CO	NO_2	HP	VAC.
1 IDLE	736	1.660	9.94	105	12.395	2678	172	724	8	.232	39.8	168	1.7	0	17.2
2 30 PCT T	143	.720	12.32	279	13.199	9985	117	1101	69	.077	9.0	85	5.3	29	13.3
3 60 PCT T	106	.650	12.73	726	13.499	15160	129	1475	271	.147	18.9	217	39.8	59	7.3
4 30 PCT T	98	.740	12.46	353	13.306	9985	79	1122	88	.077	6.1	86	6.8	29	13.3
5 10 PCT T	82	.890	12.38	310	13.359	6128	41	825	47	.057	2.3	47	2.7	10	19.1
6 30 PCT T	86	.640	12.42	338	13.153	9928	70	976	85	.077	5.4	75	6.5	29	13.3
7 90 PCT T	125	2.210	12.05	1542	14.395	20607	193	6391	733	.113	21.8	722	82.8	87	2.4
8 30 PCT T	80	.690	12.53	389	13.306	9985	65	1046	97	.077	5.0	81	7.5	29	13.3
9 C.T.	93	1.820	12.45	144	14.370	4766	33	1219	16	.143	4.8	174	2.3	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											4.0	59	5.5		
1 IDLE	736	1.660	9.94	105	12.395	2678	172	724	8	.232	39.8	168	1.7	0	17.2
2 30 PCT T	112	.660	12.48	335	13.261	9985	91	1004	84	.077	7.0	77	6.4	29	13.3
3 60 PCT T	87	.640	12.74	812	13.474	15160	106	1455	303	.147	15.5	214	44.6	59	7.3
4 30 PCT T	87	1.000	12.50	354	13.594	9985	69	1484	86	.077	5.3	114	6.6	29	13.3
5 10 PCT T	70	.650	12.36	335	13.086	6128	35	615	52	.057	2.0	35	3.0	10	19.1
6 30 PCT T	85	.780	12.51	376	13.382	9928	68	1169	93	.077	5.2	90	7.1	29	13.3
7 90 PCT T	114	2.190	12.08	1601	14.393	20607	176	6339	761	.113	19.9	716	86.0	87	2.4
8 30 PCT T	74	.710	12.47	409	13.260	9985	60	1080	102	.077	4.6	83	7.9	29	13.3
9 C.T.	96	1.520	12.72	137	14.346	4766	35	1020	15	.143	5.0	146	2.2	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											3.7	59	5.9		
1 IDLE	461	1.960	10.56	127	13.018	2678	102	814	9	.232	23.8	189	2.0	0	17.2
2 30 PCT T	103	.710	12.49	335	13.311	9985	83	1076	83	.077	6.4	83	6.4	29	13.3
3 60 PCT T	87	.690	12.80	832	13.584	15160	105	1556	308	.147	15.4	229	45.3	59	7.3
4 30 PCT T	76	.670	12.57	371	13.322	9985	62	1014	92	.077	4.7	78	7.1	29	13.3
5 10 PCT T	64	.710	12.49	330	13.269	6128	32	662	51	.057	1.8	38	2.9	10	19.1
6 30 PCT T	72	.610	12.53	351	13.218	9928	58	926	88	.077	4.5	71	6.7	29	13.3
7 90 PCT T	99	1.810	12.22	1628	14.137	20607	156	5330	788	.113	17.6	602	89.0	87	2.4
8 30 PCT T	71	.740	12.61	387	13.427	9985	57	1112	96	.077	4.4	86	7.4	29	13.3
9 C.T.	109	1.630	12.45	149	14.198	4766	40	1105	17	.143	5.7	158	2.4	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											3.0	55	6.0		
1 IDLE	461	1.970	10.56	127	13.028	2678	102	818	9	.232	23.7	190	2.0	0	17.2
2 30 PCT T	98	.680	12.50	354	13.286	9985	80	1032	88	.077	6.1	79	6.8	29	13.3
3 60 PCT T	84	.660	12.78	843	13.531	15160	102	1494	314	.147	14.9	220	46.1	59	7.3
4 30 PCT T	74	.790	12.62	375	13.490	9985	59	1181	92	.077	4.6	91	7.1	29	13.3
5 10 PCT T	62	.750	12.50	345	13.317	6128	31	697	53	.057	1.8	40	3.0	10	19.1
6 30 PCT T	71	.690	12.53	367	13.297	9928	57	1041	91	.077	4.4	80	7.0	29	13.3
7 90 PCT T	100	1.840	12.31	1694	14.258	20607	156	5372	813	.113	17.6	607	91.9	87	2.4
8 30 PCT T	70	.690	12.60	411	13.366	9985	56	1041	102	.077	4.3	80	7.8	29	13.3
9 C.T.	83	1.710	12.59	155	14.390	4766	30	1144	17	.143	4.2	164	2.4	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											2.9	55	6.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											3.9	59	5.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											3.0	55	6.1		

FOUR CYCLE COMPOSITE =
HC- NDIR 0.35(3.9) + 0.65(3.0) = 3.280 GM/BHP HR
CO- NDIR 0.35(58.7) + 0.65(54.9) = 56.263 GM/BHP HR
NO2-NDIR 0.35(5.7) + 0.65(6.1) = 5.976 GM/BHP HR
CORRECTED NO2 = 6.522 GM/BHP HR
BSFC = .729 LB/BHP HR

	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
MODE	HC-FID	CO	CO_2	NO-CL	CARBON	CONS.	HC	CO	NO_2	FACT.	HC-FID	CO	NO_2-CL	HP	VAC.
1 IDLE	9301	1.660	9.94	80	12.530	2678	199	717	6	.232	46.1	166	1.3	0	17.2
2 30 PCT T	1905	.720	12.32	240	13.231	9985	144	1098	60	.077	11.1	85	4.6	29	13.3
3 60 PCT T	1686	.650	12.73	680	13.549	15160	189	1469	253	.147	27.7	216	37.1	59	7.3
4 30 PCT T	1627	.740	12.46	320	13.363	9985	122	1117	79	.077	9.4	86	6.1	29	13.3
5 10 PCT T	1460	.890	12.38	260	13.416	6128	67	821	39	.057	3.8	47	2.2	10	19.1
6 30 PCT T	1625	.640	12.42	300	13.223	9928	122	971	75	.077	9.4	75	5.8	29	13.3
7 90 PCT T	2490	2.210	12.05	1438	14.509	20607	354	6340	678	.113	40.0	716	76.6	87	2.4
8 30 PCT T	1571	.690	12.53	345	13.377	9985	117	1040	85	.077	9.0	80	6.6	29	13.3
9 C.T.	1234	1.820	12.45	119	14.393	4766	41	1217	13	.143	5.8	174	1.8	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.8	59	5.1		
1 IDLE	9301	1.660	9.94	80	12.530	2678	199	717	6	.232	46.1	166	1.3	0	17.2
2 30 PCT T	1402	.660	12.48	290	13.280	9985	105	1002	72	.077	8.1	77	5.6	29	13.3
3 60 PCT T	1292	.640	12.74	705	13.509	15160	145	1451	263	.147	21.3	213	38.6	59	7.3
4 30 PCT T	1237	1.000	12.50	330	13.624	9985	91	1480	80	.077	7.0	114	6.2	29	13.3
5 10 PCT T	1064	.650	12.36	290	13.116	6128	50	613	45	.057	2.8	35	2.6	10	19.1
6 30 PCT T	1348	.780	12.51	345	13.425	9928	100	1165	85	.077	7.7	90	6.5	29	13.3
7 90 PCT T	1981	2.190	12.08	1525	14.468	20607	282	6301	721	.113	31.9	712	81.5	87	2.4
8 30 PCT T	1290	.710	12.47	370	13.309	9985	97	1076	92	.077	7.5	83	7.1	29	13.3
9 C.T.	1418	1.520	12.72	105	14.382	4766	47	1018	12	.143	6.7	146	1.7	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.0	58	5.4		
1 IDLE	6137	1.960	10.56	190	13.134	2678	125	807	13	.232	29.0	187	3.0	0	17.2
2 30 PCT T	1851	.710	12.49	300	13.385	9985	138	1070	74	.077	10.6	82	5.7	29	13.3
3 60 PCT T	1800	.690	12.80	770	13.670	15160	200	1546	284	.147	29.4	227	41.7	59	7.3
4 30 PCT T	1628	.670	12.57	335	13.403	9985	121	1008	83	.077	9.3	78	6.4	29	13.3
5 10 PCT T	1403	.710	12.49	280	13.340	6128	64	659	43	.057	3.7	38	2.4	10	19.1
6 30 PCT T	1570	.610	12.53	320	13.297	9928	117	920	79	.077	9.0	71	6.1	29	13.3
7 90 PCT T	2203	1.810	12.22	1563	14.250	20607	319	5287	750	.113	36.0	597	84.8	87	2.4
8 30 PCT T	1629	.740	12.61	355	13.513	9985	120	1105	87	.077	9.3	85	6.7	29	13.3
9 C.T.	1531	1.630	12.45	79	14.233	4766	51	1103	9	.143	7.3	158	1.3	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.1	54	5.6		
1 IDLE	6137	1.970	10.56	90	13.144	2678	125	811	6	.232	29.0	188	1.4	0	17.2
2 30 PCT T	1290	.680	12.50	310	13.309	9985	97	1031	77	.077	7.5	79	5.9	29	13.3
3 60 PCT T	1686	.660	12.78	790	13.609	15160	188	1485	292	.147	27.6	218	43.0	59	7.3
4 30 PCT T	1686	.790	12.62	350	13.579	9985	124	1173	85	.077	9.5	90	6.6	29	13.3
5 10 PCT T	1459	.750	12.50	300	13.396	6128	67	693	46	.057	3.8	40	2.6	10	19.1
6 30 PCT T	1627	.690	12.53	340	13.383	9928	121	1034	84	.077	9.3	80	6.4	29	13.3
7 90 PCT T	2262	1.840	12.31	1625	14.376	20607	324	5328	773	.113	36.6	602	87.4	87	2.4
8 30 PCT T	1684	.690	12.60	370	13.458	9985	125	1034	91	.077	9.6	80	7.0	29	13.3
9 C.T.	1325	1.710	12.59	88	14.432	4766	44	1141	10	.143	6.3	163	1.4	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.0	55	5.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											5.4	58	5.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											5.0	55	5.7		

FOUR CYCLE COMPOSITE =
HC- FID 0.35(5.4) + 0.65(5.0) = 5.154 GM/BHP HR
CO- NDIR 0.35(58.4) + 0.65(54.6) = 55.912 GM/BHP HR
NO2-CL 0.35(5.2) + 0.65(5.7) = 5.530 GM/BHP HR
CORRECTED NO2 = 6.035 GM/BHP HR
BSFC = .729 LB/BHP HR

TABLE D-18. MASS EMISSIONS BY NINE-MODE EPA

ENGINE 4-D TEST 43 RUN-3 1973 CALIF ENGINE 06-28-73 K =1.079 HUM =106.5 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	1034	1.500	10.41	100	13.027	2678	230	623	7	.232	53.3	145	1.6	0	17.2
2 30 PCT T	215	.730	13.45	283	14.412	9985	161	1022	65	.077	12.4	79	5.0	29	13.3
3 60 PCT T	154	.660	13.78	747	14.606	15160	173	1384	257	.147	25.4	203	37.8	59	7.3
4 30 PCT T	141	.750	13.49	336	14.392	9985	106	1051	77	.077	8.1	81	6.0	29	13.3
5 10 PCT T	134	.950	13.32	308	14.416	6128	62	816	43	.057	3.5	47	2.5	10	19.1
6 30 PCT T	122	.670	13.53	334	14.332	9928	91	938	77	.077	7.0	72	5.9	29	13.3
7 90 PCT T	153	2.510	12.87	1519	15.545	20607	219	6721	669	.113	24.8	759	75.6	87	2.9
8 30 PCT T	113	.750	13.54	374	14.412	9985	85	1050	86	.077	6.5	81	6.6	29	13.3
9 C.T.	117	1.630	12.59	139	14.346	4766	42	1099	15	.143	6.0	156	2.1	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.2	58	5.1		
1 IDLE	1034	1.500	10.41	100	13.027	2678	230	623	7	.232	53.3	145	1.6	0	17.2
2 30 PCT T	125	.700	13.38	320	14.215	9985	95	993	75	.077	7.3	76	5.7	29	13.3
3 60 PCT T	104	.670	13.82	779	14.602	15160	117	1405	269	.147	17.1	207	39.5	59	7.3
4 30 PCT T	94	.710	13.47	366	14.282	9985	71	1003	85	.077	5.5	77	6.5	29	13.3
5 10 PCT T	80	.720	13.31	300	14.116	6128	38	631	43	.057	2.1	36	2.5	10	19.1
6 30 PCT T	90	.730	13.36	345	14.187	9928	68	1032	80	.077	5.2	79	6.2	29	13.3
7 90 PCT T	119	2.170	12.98	1548	15.279	20607	173	5912	693	.113	19.6	668	78.3	87	2.9
8 30 PCT T	84	.710	13.54	383	14.341	9985	63	999	88	.077	4.9	77	6.8	29	13.3
9 C.T.	105	1.520	12.45	126	14.083	4766	38	1039	14	.143	5.5	149	2.0	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											4.3	54	5.3		
1 IDLE	609	1.690	10.96	116	13.308	2678	132	687	8	.232	30.7	159	1.8	0	17.2
2 30 PCT T	115	.720	13.28	331	14.124	9985	88	1028	78	.077	6.8	79	6.0	29	13.3
3 60 PCT T	99	.710	13.69	808	14.507	15160	112	1499	280	.147	16.4	220	41.2	59	7.3
4 30 PCT T	86	.740	13.49	356	14.323	9985	65	1042	82	.077	5.0	80	6.3	29	13.3
5 10 PCT T	73	.880	13.26	301	14.219	6128	34	766	43	.057	1.9	44	2.5	10	19.1
6 30 PCT T	82	.690	13.38	354	14.159	9928	62	977	82	.077	4.8	75	6.3	29	13.3
7 90 PCT T	117	2.300	13.12	1496	15.546	20607	167	6158	658	.113	18.9	696	74.4	87	2.9
8 30 PCT T	79	.760	13.58	348	14.425	9985	59	1063	80	.077	4.5	82	6.2	29	13.3
9 C.T.	97	1.630	12.72	121	14.455	4766	35	1086	13	.143	4.9	155	1.9	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											3.3	57	5.2		
1 IDLE	609	1.690	10.96	116	13.308	2678	132	687	8	.232	30.7	159	1.8	0	17.2
2 30 PCT T	112	.700	13.24	325	14.061	9985	86	1004	77	.077	6.6	77	5.9	29	13.3
3 60 PCT T	91	.690	13.52	782	14.308	15160	104	1477	275	.147	15.3	217	40.4	59	7.3
4 30 PCT T	82	.730	13.12	360	13.939	9985	63	1056	86	.077	4.9	81	6.6	29	13.3
5 10 PCT T	67	.710	13.05	308	13.832	6128	32	635	45	.057	1.8	36	2.6	10	19.1
6 30 PCT T	77	.630	13.18	341	13.893	9928	59	909	81	.077	4.6	70	6.2	29	13.3
7 90 PCT T	120	2.310	12.62	1559	15.060	20607	177	6385	706	.113	20.0	722	79.8	87	2.9
8 30 PCT T	75	.710	13.27	379	14.061	9985	58	1018	89	.077	4.4	78	6.9	29	13.3
9 C.T.	86	1.710	12.45	131	14.253	4766	31	1155	15	.143	4.4	165	2.1	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											3.3	57	5.4		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											4.8	56	5.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											3.3	57	5.3		

FOUR CYCLE COMPOSITE -

HC- NDIR 0.35(4.8) + 0.65(3.3) = 3.830 GM/BHP HR
CO- NDIR 0.35(55.9) + 0.65(56.9) = 56.569 GM/BHP HR
NO2-NDIR 0.35(5.2) + 0.65(5.3) = 5.281 GM/BHP HR
CORRECTED NO2 = 5.697 GM/BHP HR
BSFC = .729 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	9436	1.500	10.41	75	12.854	2678	197	631	5	.232	45.6	146	1.2	0	17.2
2 30 PCT T	1810	.730	13.45	260	14.361	9985	126	1025	60	.077	9.7	79	4.6	29	13.3
3 60 PCT T	1644	.660	13.78	710	14.604	15160	171	1384	245	.147	25.1	203	36.0	59	7.3
4 30 PCT T	1584	.750	13.49	330	14.398	9985	110	1051	76	.077	8.5	81	5.9	29	13.3
5 10 PCT T	1472	.950	13.32	270	14.417	6128	63	816	38	.057	3.6	46	2.2	10	19.1
6 30 PCT T	1527	.670	13.53	330	14.353	9928	106	936	76	.077	8.1	72	5.8	29	13.3
7 90 PCT T	2456	2.510	12.87	1425	15.626	20607	324	6687	624	.113	36.6	756	70.5	87	2.9
8 30 PCT T	1811	.750	13.54	363	14.471	9985	125	1045	83	.077	9.6	80	6.4	29	13.3
9 C.T.	1652	1.630	12.59	65	14.385	4766	55	1091	7	.143	7.8	156	1.0	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.5	58	4.8		
1 IDLE	9436	1.500	10.41	75	12.854	2678	197	631	5	.232	45.6	146	1.2	0	17.2
2 30 PCT T	1752	.700	13.38	290	14.255	9985	123	990	67	.077	9.4	76	5.2	29	13.3
3 60 PCT T	1985	.670	13.82	750	14.688	15160	206	1397	257	.147	30.1	205	37.8	59	7.3
4 30 PCT T	1980	.710	13.47	335	14.378	9985	137	996	77	.077	10.6	77	5.9	29	13.3
5 10 PCT T	1299	.720	13.31	285	14.160	6128	56	629	41	.057	3.2	36	2.3	10	19.1
6 30 PCT T	1582	.730	13.36	325	14.248	9928	110	1027	75	.077	8.5	79	5.8	29	13.3
7 90 PCT T	2337	2.170	12.98	1500	15.384	20607	313	5872	667	.113	35.4	664	75.4	87	2.9
8 30 PCT T	2037	.710	13.54	370	14.454	9985	141	991	85	.077	10.8	76	6.5	29	13.3
9 C.T.	1297	1.520	12.45	93	14.100	4766	44	1038	10	.143	6.3	148	1.5	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											5.7	54	5.0		
1 IDLE	6646	1.690	10.96	85	13.315	2678	134	687	6	.232	31.0	159	1.3	0	17.2
2 30 PCT T	1468	.720	13.28	305	14.147	9985	104	1027	71	.077	8.0	79	5.5	29	13.3
3 60 PCT T	1644	.710	13.69	790	14.564	15160	171	1493	273	.147	25.1	219	40.1	59	7.3
4 30 PCT T	1471	.740	13.49	345	14.377	9985	102	1038	80	.077	7.9	80	6.1	29	13.3
5 10 PCT T	1300	.880	13.26	290	14.270	6128	56	763	41	.057	3.2	44	2.4	10	19.1
6 30 PCT T	1582	.690	13.38	345	14.228	9928	110	973	80	.077	8.5	75	6.2	29	13.3
7 90 PCT T	2342	2.300	13.12	1487	15.654	20607	308	6116	650	.113	34.8	691	73.4	87	2.9
8 30 PCT T	1586	.760	13.58	340	14.499	9985	109	1057	78	.077	8.4	81	6.0	29	13.3
9 C.T.	1220	1.630	12.72	85	14.472	4766	40	1084	9	.143	5.7	155	1.3	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											4.7	56	5.1		
1 IDLE	6646	1.690	10.96	85	13.315	2678	134	687	6	.232	31.0	159	1.3	0	17.2
2 30 PCT T	1468	.700	13.24	310	14.087	9985	104	1002	73	.077	8.0	77	5.6	29	13.3
3 60 PCT T	1697	.690	13.52	750	14.380	15160	179	1469	263	.147	26.3	216	38.6	59	7.3
4 30 PCT T	1579	.730	13.12	330	14.008	9985	114	1051	78	.077	8.7	81	6.0	29	13.3
5 10 PCT T	1296	.710	13.05	280	13.890	6128	57	633	41	.057	3.3	36	2.3	10	19.1
6 30 PCT T	1466	.630	13.18	315	13.957	9928	104	905	74	.077	8.0	70	5.7	29	13.3
7 90 PCT T	2390	2.310	12.62	1463	15.169	20607	325	6339	660	.113	36.7	716	74.6	87	2.9
8 30 PCT T	1525	.710	13.27	355	14.132	9985	108	1013	83	.077	8.3	78	6.4	29	13.3
9 C.T.	1384	1.710	12.45	91	14.298	4766	46	1151	10	.143	6.6	165	1.4	0	21.3
CYCLE COMPOSITE IN GM/BHP HR											4.9	57	5.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											5.6	56	4.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											4.8	57	5.1		

FOUR CYCLE COMPOSITE -

HC- FID 0.35(5.6) + 0.65(4.8) = 5.081 GM/BHP HR
CO- NDIR 0.35(55.7) + 0.65(56.7) = 56.337 GM/BHP HR
NO2-CL 0.35(4.9) + 0.65(5.1) = 5.008 GM/BHP HR
CORRECTED NO2 = 5.402 GM/BHP HR
BSFC = .729 LB/BHP HR

TABLE D-19. MASS EMISSIONS BY NINE-MODE EPA

ENGINE 4-1   TEST-41   RUN-1   EGR-AIR-CAT   06-23-73   K =1.042   HUM = 89.8 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	70	.060	8.79	73	8.926	2767	23	38	8	.232	5.4	9	1.7	0	15.6
2 30 PCT T	32	.060	9.99	186	10.085	9344	32	112	57	.077	2.5	9	4.4	28	13.1
3 60 PCT T	28	.090	11.22	689	11.340	15014	40	241	303	.147	5.9	35	44.5	57	6.6
4 30 PCT T	23	.060	9.42	317	9.505	9344	24	119	103	.077	1.9	9	8.0	28	13.1
5 10 PCT T	23	.060	8.84	212	8.925	6350	18	86	50	.057	1.0	5	2.9	9	18.5
6 30 PCT T	25	.070	10.41	264	10.507	9344	24	126	78	.077	1.8	10	6.0	28	13.1
7 90 PCT T	25	.130	12.07	1946	12.227	19505	43	419	766	.113	4.9	47	86.5	85	2.5
8 30 PCT T	21	.060	9.45	331	9.533	9344	22	119	108	.077	1.7	9	8.3	28	13.1
9 C.T.	23	.060	8.48	148	8.565	3765	11	53	22	.143	1.6	8	3.1	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											1.0	5	6.1		
1 IDLE	70	.060	8.79	73	8.926	2767	23	38	8	.232	5.4	9	1.7	0	15.6
2 30 PCT T	27	.070	10.26	238	10.359	9344	26	128	71	.077	2.0	10	5.5	28	13.1
3 60 PCT T	25	.100	11.26	674	11.387	15014	36	266	295	.147	5.2	39	43.4	57	6.6
4 30 PCT T	23	.060	9.45	317	9.535	9344	24	119	103	.077	1.9	9	7.9	28	13.1
5 10 PCT T	24	.060	9.76	226	9.846	6350	17	78	48	.057	1.0	4	2.8	9	18.5
6 30 PCT T	23	.070	10.67	295	10.765	9344	22	123	85	.077	1.7	9	6.5	28	13.1
7 90 PCT T	27	.130	12.04	1908	12.199	19505	47	420	747	.113	5.3	47	84.5	85	2.5
8 30 PCT T	28	.060	8.35	344	8.440	9344	33	134	126	.077	2.6	10	9.7	28	13.1
9 C.T.	21	.060	7.44	12[illegible]	7.523	3765	11	61	20	.143	1.6	9	2.9	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											1.0	5	6.1		
1 IDLE	65	.090	9.26	115	9.420	2767	21	53	11	.232	4.8	12	2.6	0	15.6
2 30 PCT T	29	.070	10.22	238	10.321	9344	28	128	72	.077	2.2	10	5.5	28	13.1
3 60 PCT T	25	.070	10.51	659	10.607	15014	38	200	310	.147	5.6	29	45.6	57	6.6
4 30 PCT T	23	.060	9.73	350	9.815	9344	24	115	111	.077	1.8	9	8.5	28	13.1
5 10 PCT T	24	.060	9.14	225	9.226	6350	18	83	51	.057	1.0	5	2.9	9	18.5
6 30 PCT T	26	.070	10.32	295	10.418	9344	25	127	88	.077	1.9	10	6.8	28	13.1
7 90 PCT T	27	.140	12.21	1908	12.379	19505	46	446	737	.113	5.2	50	83.2	85	2.5
8 30 PCT T	24	.060	10.08	344	10.166	9344	24	111	105	.077	1.8	9	8.1	28	13.1
9 C.T.	32	.060	7.33	98	7.425	3765	18	61	16	.143	2.5	9	2.4	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											1.0	5	6.1		
1 IDLE	65	.090	9.26	115	9.420	2767	21	53	11	.232	4.8	12	2.6	0	15.6
2 30 PCT T	30	.070	10.26	248	10.368	9344	29	128	74	.077	2.2	10	5.7	28	13.1
3 60 PCT T	28	.100	11.34	644	11.480	15014	39	263	279	.147	5.8	39	41.0	57	6.6
4 30 PCT T	25	.070	9.77	296	9.867	9344	26	134	93	.077	2.0	10	7.1	28	13.1
5 10 PCT T	26	.060	9.28	218	9.368	6350	19	82	49	.057	1.1	5	2.8	9	18.5
6 30 PCT T	27	.060	10.28	290	10.369	9344	26	109	87	.077	2.0	8	6.7	28	13.1
7 90 PCT T	27	.120	12.02	1908	12.169	19505	47	389	749	.113	5.3	44	84.7	85	2.5
8 30 PCT T	24	.060	9.62	344	9.706	9344	25	117	110	.077	1.9	9	8.5	28	13.1
9 C.T.	35	.060	8.23	122	8.328	3765	17	58	18	.143	2.4	8	2.6	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											1.0	5	6.0		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											1.0	5	6.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											1.0	5	6.0		

FOUR CYCLE COMPOSITE =

HC- NDIR 0.35(1.0) + 0.65(1.0) = .999 GM/BHP HR
CO- NDIR 0.35(5.3) + 0.65(5.3) = 5.318 GM/BHP HR
NO2-NDIR 0.35(6.1) + 0.65(6.0) = 6.065 GM/BHP HR
CORRECTED NO2 = 6.321 GM/BHP HR
BSFC = .719 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	880	.060	8.79	45	8.938	2767	27	38	5	.232	6.3	9	1.1	0	15.6
2 30 PCT T	86	.060	9.99	150	10.059	9344	8	113	46	.077	.6	9	3.6	28	13.1
3 60 PCT T	117	.090	11.22	680	11.322	15014	16	241	299	.147	2.3	35	44.0	57	6.6
4 30 PCT T	102	.060	9.42	290	9.490	9344	10	119	95	.077	.8	9	7.3	28	13.1
5 10 PCT T	61	.060	8.84	175	8.906	6350	4	86	41	.057	.2	5	2.4	9	18.5
6 30 PCT T	103	.070	10.41	240	10.490	9344	9	126	71	.077	.7	10	5.5	28	13.1
7 90 PCT T	126	.130	12.07	1937	12.213	19505	20	419	762	.113	2.3	47	86.1	85	2.5
8 30 PCT T	69	.060	9.45	290	9.517	9344	7	119	95	.077	.5	9	7.3	28	13.1
9 C.T.	257	.060	8.48	105	8.566	3765	11	53	15	.143	1.6	8	2.2	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											.6	5	5.9		
1 IDLE	880	.060	8.79	45	8.938	2767	27	38	5	.232	6.3	9	1.1	0	15.6
2 30 PCT T	130	.070	10.26	215	10.343	9344	12	128	64	.077	.9	10	5.0	28	13.1
3 60 PCT T	83	.100	11.26	640	11.368	15014	11	267	281	.147	1.6	39	41.3	57	6.6
4 30 PCT T	75	.060	9.45	292	9.518	9344	7	119	95	.077	.6	9	7.3	28	13.1
5 10 PCT T	48	.060	9.76	187	9.825	6350	3	78	40	.057	.2	4	2.3	9	18.5
6 30 PCT T	84	.070	10.67	270	10.748	9344	8	123	78	.077	.6	9	6.0	28	13.1
7 90 PCT T	90	.130	12.04	1375	12.179	19505	14	421	731	.113	1.6	48	82.6	85	2.5
8 30 PCT T	54	.060	8.35	315	8.415	9344	6	135	116	.077	.5	10	8.9	28	13.1
9 C.T.	308	.060	7.44	70	7.531	3765	15	61	12	.143	2.2	9	1.7	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											.6	5	5.8		
1 IDLE	807	.090	9.26	85	9.431	2767	24	53	8	.232	5.5	12	1.9	0	15.6
2 30 PCT T	130	.070	10.22	215	10.303	9344	12	128	65	.077	.9	10	5.0	28	13.1
3 60 PCT	82	.070	10.51	635	10.588	15014	12	201	299	.147	1.7	29	43.9	57	6.6
4 30 PCT	82	.060	9.73	295	9.798	9344	8	116	93	.077	.6	9	7.2	28	13.1
5 10 PCT T	59	.060	9.14	195	9.205	6350	4	84	45	.057	.2	5	2.5	9	18.5
6 30 PCT T	89	.070	10.32	280	10.399	9344	8	127	84	.077	.6	10	6.4	28	13.1
7 90 PCT T	90	.140	12.21	1387	12.360	19505	15	446	727	.113	1.7	50	82.1	85	2.5
8 30 PCT T	55	.060	10.08	310	10.145	9344	5	112	95	.077	.4	9	7.2	28	13.1
9 C.T.	388	.060	7.33	65	7.429	3765	20	61	11	.143	2.8	9	1.6	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											.5	5	5.8		
1 IDLE	807	.090	9.26	85	9.431	2767	24	53	8	.232	5.5	12	1.9	0	15.6
2 30 PCT T	137	.070	10.26	215	10.344	9344	12	128	64	.077	1.0	10	5.0	28	13.1
3 60 PCT T	83	.100	11.39	620	11.498	15014	11	269	269	.147	1.6	39	39.5	57	6.6
4 30 PCT T	76	.070	9.77	275	9.848	9344	7	134	86	.077	.6	10	6.5	28	13.1
5 10 PCT T	84	.060	9.28	190	9.345	6350	4	82	43	.057	.2	5	2.4	9	18.5
6 30 PCT T	89	.060	10.28	270	10.349	9344	8	109	81	.077	.6	8	6.2	28	13.1
7 90 PCT T	90	.120	12.02	1288	12.149	19505	14	389	687	.113	1.6	44	77.6	85	2.5
8 30 PCT T	54	.060	9.62	305	9.685	9344	5	117	98	.077	.4	9	7.5	28	13.1
9 C.T.	434	.060	8.23	90	8.334	3765	20	55	13	.143	2.8	8	1.9	0	22.0
CYCLE COMPOSITE IN GM/BHP HR											.5	5	5.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.6	5	5.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.5	5	5.7		

FOUR CYCLE COMPOSITE =

HC- FID 0.35(.6) + 0.65(.5) = .539 GM/BHP HR
CO- NDIR 0.35(5.3) + 0.65(5.3) = 5.325 GM/BHP HR
NO2-CL 0.35(5.8) + 0.65(5.7) = 5.723 GM/BHP HR
CORRECTED NO2 = 5.965 GM/BHP HR
BSFC = .719 LB/BHP HR

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                    TABLE D-20. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-1   TEST-41  RUN-2   EGR-AIR-CAT            06-26-73      K =1.062      HUM = 98.0  GM/LB
--------------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.     WEIGHTED GM/HR          MAN.
MODE          HC     CO    CO2     NO     CARBON   CONS.     HC     CO     NO2    FACT.    HC     CO   NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE        84    .060   8.82     98    8.971    2767      28     37     10    .232     6.5     9   2.3     0   15.6
2 30 PCT T    33    .020   9.77    212    9.826    9344      34     38     67    .077     2.6     3   5.2    28   13.1
3 60 PCT T    28    .050  11.16    624   11.240   15014      40    135    279    .147     5.9    20  41.0    57    6.6
4 30 PCT T    28    .020   9.99    290   10.040    9344      28     38     90    .077     2.2     3   6.9    28   13.1
5 10 PCT T    28    .020   8.92    199    8.970    6350      21     29     47    .057     1.2     2   2.7     9   18.5
6 30 PCT T    28    .020   9.88    264    9.930    9344      28     38     82    .077     2.2     3   6.4    28   13.1
7 90 PCT T    33    .080  11.66   1388   11.776   19505      59    268    763    .113     6.7    30  86.3    85    2.5
8 30 PCT T    28    .030  10.05    331   10.110    9344      28     56    102    .077     2.2     4   7.8    28   13.1
9 C.T.        28    .020   8.34    122    8.390    3765      19     18     18    .143     1.9     3   2.6     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.2     3   6.0
1 IDLE        84    .060   8.82     98    8.971    2767      28     37     10    .232     6.5     9   2.3     0   15.6
2 30 PCT T    33    .030   9.88    238    9.946    9344      33     57     74    .077     2.6     4   5.7    28   13.1
3 60 PCT T    28    .050  11.28    594   11.360   15014      40    133    263    .147     5.9    20  38.6    57    6.6
4 30 PCT T    28    .030   9.99    309   10.050    9344      28     56     94    .077     2.2     4   7.2    28   13.1
5 10 PCT T    28    .020   8.92    212    8.970    6350      21     29     50    .057     1.2     2   2.8     9   18.5
6 30 PCT T    28    .030   9.99    277   10.050    9344      28     56     86    .077     2.2     4   6.6    28   13.1
7 90 PCT T    28    .080  11.79   1370   11.900   19505      50    265    746    .113     5.6    30  84.2    85    2.5
8 30 PCT T    28    .030  10.10    331   10.160    9344      28     56    101    .077     2.1     4   7.8    28   13.1
9 C.T.        26    .020   7.48    122    7.528    3765      19     20     20    .143     2.0     3   2.9     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.1     3   5.8
1 IDLE        75    .060   9.02    110    9.161    2767      24     37     11    .232     5.7     9   2.6     0   15.6
2 30 PCT T    33    .030   9.96    224   10.026    9344      33     56     69    .077     2.6     4   5.3    28   13.1
3 60 PCT T    33    .050  11.31    644   11.396   15014      47    133    282    .147     6.9    20  41.4    57    6.6
4 30 PCT T    28    .020  10.10    309   10.150    9344      28     37     93    .077     2.1     3   7.2    28   13.1
5 10 PCT T    28    .020   8.92    212    8.970    6350      21     29     50    .057     1.2     2   2.8     9   18.5
6 30 PCT T    28    .030   9.99    277   10.050    9344      28     56     86    .077     2.2     4   6.6    28   13.1
7 90 PCT T    28    .080  11.79   1351   11.900   19505      50    265    735    .113     5.6    30  83.1    85    2.5
8 30 PCT T    28    .030  10.10    331   10.160    9344      28     56    101    .077     2.1     4   7.8    28   13.1
9 C.T.        33    .020   8.33    122    8.386    3765      16     18     18    .143     2.3     3   2.6     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.1     3   5.9
1 IDLE        75    .060   9.02    110    9.161    2767      24     37     11    .232     5.7     9   2.6     0   15.6
2 30 PCT T    33    .030   9.88    238    9.946    9344      33     57     74    .077     2.6     4   5.7    28   13.1
3 60 PCT T    28    .050  11.90    614   11.980   15014      40    132    267    .147     5.8    19  39.2    57    6.6
4 30 PCT T    28    .030   9.99    309   10.050    9344      28     56     94    .077     2.2     4   7.2    28   13.1
5 10 PCT T    28    .020   9.02    212    9.070    6350      21     29     49    .057     1.2     2   2.8     9   18.5
6 30 PCT T    28    .030   9.99    277   10.050    9344      28     56     86    .077     2.2     4   6.6    28   13.1
7 90 PCT T    33    .090  11.79   1370   11.916   19505      58    298    745    .113     6.6    34  84.1    85    2.5
8 30 PCT T    28    .030  10.10    331   10.160    9344      28     56    101    .077     2.1     4   7.8    28   13.1
9 C.T.        37    .020   7.97    122    8.030    3765      19     19     19    .143     2.7     3   2.7     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.1     3   5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     1.1     3   5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     1.1     3   5.9
FOUR CYCLE COMPOSITE =                     HC- NDIR 0.35(     1.1) + 0.65(     1.1) =    1.140   GM/BHP HR
                                           CO- NDIR 0.35(     2.9) + 0.65(     3.0) =    2.947   GM/BHP HR
                                           NO2-NDIR 0.35(     5.9) + 0.65(     5.9) =    5.886   GM/BHP HR
                                                                CORRECTED NO2 =    6.248   GM/BHP HR
                                                                         BSFC =     .719   LB/BHP HR


--------------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR         MAN.
MODE        HC-FID    CO    CO2   NO-CL   CARBON   CONS.     HC     CO     NO2    FACT.  HC-FID   CO  NO2-CL  HP   VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE       710    .060   8.82     65    8.951    2767      22     37      7    .232     5.1     9   1.5     0   15.6
2 30 PCT T   164    .020   9.77    180    9.806    9344      16     38     57    .077     1.2     3   4.4    28   13.1
3 60 PCT T   110    .050  11.16    600   11.221   15014      15    135    267    .147     2.2    20  39.2    57    6.6
4 30 PCT T    96    .020   9.99    270   10.020    9344       9     38     84    .077      .7     3   6.4    28   13.1
5 10 PCT T    68    .020   8.92    175    8.947    6350       5     29     41    .057      .3     2   2.4     9   18.5
6 30 PCT T   103    .020   9.88    245    9.910    9344      10     38     77    .077      .7     3   5.9    28   13.1
7 90 PCT T   111    .080  11.66   1350   11.751   19505      18    268    744    .113     2.1    30  84.1    85    2.5
8 30 PCT T    75    .030  10.05    295   10.088    9344       7     56     91    .077      .5     4   7.0    28   13.1
9 C.T.       361    .020   8.34     90    8.396    3765      16     18     13    .143     2.3     3   1.9     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .6     3   5.6
1 IDLE       710    .060   8.82     65    8.951    2767      22     37      7    .232     5.1     9   1.5     0   15.6
2 30 PCT T   130    .030   9.88    220    9.923    9344      12     57     69    .077      .9     4   5.3    28   13.1
3 60 PCT T    76    .050  11.28    590   11.338   15014      10    134    259    .147     1.5    20  38.1    57    6.6
4 30 PCT T    78    .030   9.99    280   10.028    9344       7     56     87    .077      .6     4   6.7    28   13.1
5 10 PCT T    54    .020   8.92    140    8.945    6350       4     29     33    .057      .2     2   1.9     9   18.5
6 30 PCT T    49    .030   9.99    265   10.029    9344       8     56     82    .077      .6     4   6.3    28   13.1
7 90 PCT T    98    .080  11.79   1338   11.880   19505      16    265    729    .113     1.8    30  82.4    85    2.5
8 30 PCT T    55    .030  10.10    305   10.135    9344       5     56     93    .077      .4     4   7.2    28   13.1
9 C.T.       374    .020   7.48     70    7.537    3765      19     20     12    .143     2.7     3   1.7     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .5     3   5.6
1 IDLE       746    .060   9.02     85    9.155    2767      23     37      9    .232     5.2     9   2.0     0   15.6
2 30 PCT T   137    .030   9.96    210   10.004    9344      13     57     65    .077     1.0     4   5.0    28   13.1
3 60 PCT T    72    .050  11.31    615   11.367   15014       9    133    270    .147     1.4    20  39.6    57    6.6
4 30 PCT T    89    .020  10.10    288   10.129    9344       8     37     88    .077      .6     3   6.8    28   13.1
5 10 PCT T    54    .020   8.92    195    8.945    6350       4     29     46    .057      .2     2   2.6     9   18.5
6 30 PCT T    96    .030   9.99    260   10.030    9344       9     56     80    .077      .7     4   6.2    28   13.1
7 90 PCT T    97    .080  11.79   1325   11.880   19505      16    265    728    .113     1.8    30  81.6    85    2.5
8 30 PCT T    61    .030  10.10    305   10.136    9344       6     56     93    .077      .4     4   7.2    28   13.1
9 C.T.       445    .020   8.33     90    8.399    3765      20     18     13    .143     2.9     3   1.9     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .5     3   5.7
1 IDLE       746    .060   9.02     85    9.155    2767      23     37      9    .232     5.2     9   2.0     0   15.6
2 30 PCT T   136    .030   9.88    215    9.924    9344      13     57     67    .077     1.0     4   5.2    28   13.1
3 60 PCT T    76    .050  11.90    605   11.958   15014      10    132    263    .147     1.5    19  38.7    57    6.6
4 30 PCT T    82    .030   9.99    280   10.028    9344       8     56     87    .077      .6     4   6.7    28   13.1
5 10 PCT T    54    .020   9.02    190    9.045    6350       4     28     44    .057      .2     2   2.5     9   18.5
6 30 PCT T    96    .030   9.99    265   10.030    9344       9     56     82    .077      .7     4   6.3    28   13.1
7 90 PCT T    98    .090  11.79   1325   11.890   19505      16    298    722    .113     1.8    34  81.6    85    2.5
8 30 PCT T    61    .030  10.10    300   10.136    9344       6     56     92    .077      .4     4   7.1    28   13.1
9 C.T.       403    .020   7.97    100    8.030    3765      19     19     16    .143     2.7     3   2.2     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .5     3   5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------      .5     3   5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------      .5     3   5.6
FOUR CYCLE COMPOSITE =                     HC- FID  0.35(      .5) + 0.65(      .5) =     .527   GM/BHP HR
                                           CO- NDIR 0.35(     2.9) + 0.65(     3.0) =    2.952   GM/BHP HR
                                           NO2-CL   0.35(     5.6) + 0.65(     5.6) =    5.630   GM/BHP HR
                                                                CORRECTED NO2 =    5.977   GM/BHP HR
                                                                         BSFC =     .719   LB/BHP HR
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                        TABLE D-21  MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-1   TEST-41  RUN-3   EGR-AIR-CAT             06-26-73      K =1.037     HUM = 87.6  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR            MAN.
MODE              HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.   HC        CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE           108    .030    8.13     85    8.277    2767       39      20      9    .232    9.0     [illegible]  2.2   0   15.6
2 30 PCT T        33    .020    9.66    186    9.716    9399       34      39     59    .077    2.6     [illegible]  4.6  28   13.1
3 60 PCT T        28    .050   11.09    624   11.120   15019       41     136    282    .147    6.0      20   41.4   57    6.6
4 30 PCT T        28    .020    9.77    290    9.820    9399       29      38     92    .077    2.2       3    7.1   28   13.1
5 10 PCT T        22    .020    8.82    194    8.870    6350       22      29     47    .057    1.2       2    2.7    9   18.5
6 30 PCT T        25    .020    9.66    251    9.707    9399       26      39     80    .077    2.0       3    6.2   28   13.1
7 90 PCT T        25    .080   11.53   1389   11.637   19505       45     271    773    .113    5.1      31   87.3   85    2.5
8 30 PCT T        23    .020    9.88    311    9.925    9399       23      38    103    .077    1.8       3    8.0   28   13.1
9 C.T.            33    .020    7.21    110    7.266    3765       18      21     19    .143    2.6       3    2.7    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------  1.2       3    6.0
1 IDLE           108    .030    8.13     85    8.277    2767       39      20      9    .232    9.0       5    2.2    0   15.6
2 30 PCT T        33    .020    9.77    212    9.826    9399       34      38     67    .077    2.6       3    5.2   28   13.1
3 60 PCT T        28    .050   11.16    590   11.290   15019       40     135    262    .147    5.9      20   38.5   57    6.6
4 30 PCT T        23    .030    9.77    290    9.825    9399       24      58     92    .077    1.8       4    7.1   28   13.1
5 10 PCT T        25    .020    8.82    218    8.867    6350       19      29     50    .057    1.1       2    2.9    9   18.5
6 30 PCT T        28    .030    9.77    269    9.830    9399       29      58     83    .077    2.2       4    6.4   28   13.1
7 90 PCT T        28    .080   11.66   1370   11.770   19505       50     268    754    .113    5.7      30   85.2   85    2.5
8 30 PCT T        23    .030    9.88    331    9.935    9399       23      57    103    .077    1.8       4    8.0   28   13.1
9 C.T.            24    .020    7.21     98    7.256    3765       13      21     17    .143    1.9       3    2.4    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------  1.2       3    6.0
1 IDLE            65    .030    8.72    110    8.820    2767       22      19     11    .232    5.1       4    2.7    0   15.6
2 30 PCT T        28    .060    9.77    225    9.850    9399       29      96     71    .077    2.2       7    5.5   28   13.1
3 60 PCT T        28    .020   11.16    585   11.210   15019       41      54    260    .147    6.0       8   38.2   57    6.6
4 30 PCT T        28    .020    9.77    227    9.820    9399       29      38     72    .077    2.2       3    5.5   28   13.1
5 10 PCT T        27    .020    8.82    199    8.865    6350       18      29     47    .057    1.0       2    2.7    9   18.5
6 30 PCT T        25    .090    9.77    251    9.887    9399       26     172     79    .077    2.0      13    6.1   28   13.1
7 90 PCT T        28    .030   11.66   1332   11.720   19505       50     101    736    .113    5.7      11   83.2   85    2.5
8 30 PCT T        25    .020    9.88    317    9.927    9399       25      38     99    .077    2.0       3    7.6   28   13.1
9 C.T.            33    .050    8.03    110    8.116    3765       17      47     17    .143    2.4       7    2.4    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------  1.1       2    5.7
1 IDLE            65    .030    8.72    110    8.820    2767       22      19     11    .232    5.1       4    2.7    0   15.6
2 30 PCT T        33    .030    9.77    212    9.836    9399       34      58     67    .077    2.6       4    5.1   28   13.1
3 60 PCT T        28    .050   11.16    629   11.290   15019       40     136    279    .147    5.9      20   41.0   57    6.6
4 30 PCT T        28    .030    9.66    277    9.720    9399       29      58     88    .077    2.2       4    6.8   28   13.1
5 10 PCT T        23    .020    8.82    199    8.865    6350       18      29     47    .057    1.0       2    2.7    9   18.5
6 30 PCT T        23    .020    9.77    269    9.815    9399       24      38     83    .077    1.8       3    6.4   28   13.1
7 90 PCT T        28    .080   11.53   1350   11.690   19505       51     271    751    .113    5.7      31   84.9   85    2.5
8 30 PCT T        23    .020    9.88    309    9.928    9399       23      38     95    .077    1.8       3    7.3   28   13.1
9 C.T.            24    .020    7.21     98    7.256    3765       13      21     17    .143    1.9       3    2.4    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------  1.0       3    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------  1.2       3    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------  1.0       2    5.8
FOUR CYCLE COMPOSITE =                 HC- NDIR 0.35(     1.2) + 0.65(     1.0) =    1.100   GM/BHP HR
                                       CO- NDIR 0.35(     2.7) + 0.65(     2.5) =    2.550   GM/BHP HR
                                       NO2-NDIR 0.35(     5.9) + 0.65(     5.8) =    5.830   GM/BHP HR
                                                           CORRECTED NO2 =    6.043   GM/BHP HR
                                                                    BSFC =     .719   LB/BHP HR
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE            HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          1015    .030    8.13     60    8.262    2767       34      20      7    .232    7.9       5    1.6    0   15.6
2 30 PCT T       191    .020    9.66    165    9.699    9399       18      39     53    .077    1.4       3    4.1   28   13.1
3 60 PCT T       110    .050   11.09    600   11.101   15019       15     137    269    .147    2.2      20   39.6   57    6.6
4 30 PCT T       103    .020    9.77    270    9.800    9399       10      39     85    .077     .8       3    6.6   28   13.1
5 10 PCT T        68    .020    8.82    180    8.847    6350        5      29     43    .057     .3       2    2.4    9   18.5
6 30 PCT T       109    .020    9.66    240    9.691    9399       11      39     77    .077     .8       3    5.9   28   13.1
7 90 PCT T       111    .080   11.53   1350   11.621   19505       19     271    752    .113    2.1      31   85.0   85    2.5
8 30 PCT T        69    .020    9.88    300    9.907    9399        6      38     94    .077     .5       3    7.2   28   13.1
9 C.T.           310    .020    7.21     73    7.261    3765       16      21     13    .143    2.3       3    1.8    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------   .7       3    5.7
1 IDLE          1015    .030    8.13     60    8.262    2767       34      20      7    .232    7.9       5    1.6    0   15.6
2 30 PCT T       157    .020    9.77    195    9.806    9399       15      38     62    .077    1.2       3    4.8   28   13.1
3 60 PCT T        83    .050   11.16    580   11.218   15019       11     135    258    .147    1.6      20   37.9   57    6.6
4 30 PCT T        88    .030    9.77    265    9.809    9399        8      58     84    .077     .6       4    6.5   28   13.1
5 10 PCT T        61    .020    8.82    195    8.846    6350        4      29     46    .057     .2       2    2.6    9   18.5
6 30 PCT T       103    .030    9.77    255    9.810    9399       10      58     81    .077     .8       4    6.2   28   13.1
7 90 PCT T        96    .080   11.66   1337   11.750   19505       16     268    737    .113    1.8      30   83.3   85    2.5
8 30 PCT T        61    .030    9.88    300    9.916    9399        6      57     94    .077     .4       4    7.2   28   13.1
9 C.T.           307    .020    7.21     83    7.261    3765       16      21     14    .143    2.3       3    2.0    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------   .6       3    5.6
1 IDLE           924    .030    8.72     95    8.832    2767       26      19     10    .232    6.0       4    2.3    0   15.6
2 30 PCT T       143    .050    9.77    215    9.834    9399       14      96     68    .077    1.0       7    5.2   28   13.1
3 60 PCT T        83    .020   11.16    570   11.188   15019       11      54    254    .147    1.6       8   37.3   57    6.6
4 30 PCT T        88    .020    9.77    260    9.799    9399        8      39     82    .077     .6       3    6.3   28   13.1
5 10 PCT T        61    .020    8.82    185    8.846    6350        4      29     44    .057     .2       2    2.5    9   18.5
6 30 PCT T        82    .090    9.77    250    9.868    9399        8     172     79    .077     .6      13    6.1   28   13.1
7 90 PCT T        98    .030   11.66   1300   11.700   19505       16     101    720    .113    1.8      11   81.3   85    2.5
8 30 PCT T        61    .020    9.88    290    9.906    9399        6      38     91    .077     .4       3    7.0   28   13.1
9 C.T.           380    .050    8.03     89    8.118    3765       18      47     14    .143    2.5       7    2.0    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------   .6       2    5.6
1 IDLE           924    .030    8.72     95    8.832    2767       26      19     10    .232    6.0       4    2.3    0   15.6
2 30 PCT T       143    .030    9.77    200    9.819    9399       14      58     63    .077    1.0       4    4.9   28   13.1
3 60 PCT T        76    .060   11.16    610   11.218   15019       10     135    271    .147    1.5      20   39.8   57    6.6
4 30 PCT T        82    .030    9.66    260    9.698    9399        8      58     83    .077     .6       4    6.4   28   13.1
5 10 PCT T        64    .020    8.82    175    8.845    6350        4      29     42    .057     .2       2    2.4    9   18.5
6 30 PCT T        96    .020    9.77    260    9.800    9399        9      39     82    .077     .7       3    6.3   28   13.1
7 90 PCT T        90    .080   11.53   1325   11.619   19505       15     271    738    .113    1.7      31   83.4   85    2.5
8 30 PCT T        61    .020    9.88    280    9.906    9399        6      38     88    .077     .4       3    6.8   28   13.1
9 C.T.           307    .020    7.21     69    7.261    3765       16      21     12    .143    2.3       3    1.7    0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------   .5       3    5.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------   .6       3    5.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------   .5       2    5.6
FOUR CYCLE COMPOSITE =                 HC- FID  0.35(      .6) + 0.65(      .5) =     .581   GM/BHP HR
                                       CO- NDIR 0.35(     2.7) + 0.65(     2.5) =    2.559   GM/BHP HR
                                       NO2-CL   0.35(     5.7) + 0.65(     5.6) =    5.632   GM/BHP HR
                                                           CORRECTED NO2 =    5.838   GM/BHP HR
                                                                    BSFC =     .719   LB/BHP HR
```

TABLE D-22. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-00 TEST-34 RUN-1 1972 STANDARD ENGINE 06-18-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.0	5.4	15.5	0	3926	1.750	11.41	63
2	1200	4.2	1	19.6	8.1	15.0	0	2085	1.440	12.31	100
3	1200	15.8	4	18.7	8.8	15.2	0	1857	1.130	12.45	130
4	1200	40.3	9	17.0	10.0	15.8	0	1682	.560	12.59	225
5	1200	56.0	13	16.3	11.5	14.5	0	2711	1.430	12.59	330
6	1200	112.0	26	11.8	15.9	14.9	0	2616	1.070	12.72	1038
7	1200	168.0	38	6.1	21.3	15.0	0	2309	.670	13.00	1587
8	1200	185.5	42	4.6	22.7	14.8	0	2512	.640	13.29	1812
9	1200	208.3	48	1.8	27.7	14.1	0	2463	2.700	11.92	1000
10	1200	225.8	52	.3	32.4	12.2	0	3777	6.210	10.56	537
11	700	0.0	0	18.1	5.1	15.2	0	3231	2.330	11.28	75
12	1200	0.0	0	22.2	5.6	15.9	0	27287	2.020	8.82	25
13	2300	252.0	110	1.0	59.7	12.6	0	2588	4.980	11.28	780
14	2300	234.5	103	2.3	53.5	12.9	0	2294	4.370	11.53	855
15	2300	210.0	92	3.5	47.5	14.2	0	1440	1.860	12.59	1437
16	2300	190.8	84	4.6	43.8	14.5	0	1017	1.430	12.59	1287
17	2300	124.5	57	11.4	30.9	14.6	0	2029	.900	12.86	1700
18	2300	64.8	28	16.2	22.0	14.7	0	1579	1.090	12.72	675
19	2300	43.8	19	17.7	19.0	14.7	0	1494	1.090	12.72	450
20	2300	21.0	9	19.3	16.2	14.8	0	1242	1.070	12.86	275
21	2300	8.8	4	20.2	14.6	14.5	0	1441	1.380	12.72	200
22	700	0.0	0	17.0	5.5	15.1	0	3351	2.130	11.53	85
23	2300	0.0	0	23.8	5.6	16.9	0	50344	1.150	6.05	50

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	71.0	639	3.8	.070	0.0	I	R	R	R
2	0.0	54.9	766	8.7	.060	.1	0.0	57.20	797.9	9.1
3	0.0	53.9	662	12.5	.060	.2	0.0	14.92	183.3	3.5
4	0.0	57.3	385	25.4	.050	.5	0.0	6.22	41.8	2.8
5	0.0	94.0	1054	40.0	.030	.4	0.0	7.73	82.4	3.1
6	0.0	134.3	1109	176.9	.060	1.5	0.0	5.25	43.4	6.9
7	0.0	160.5	941	366.2	0.000	0.0	0.0	4.18	24.5	9.5
8	0.0	182.4	939	436.8	.040	1.7	0.0	4.30	22.1	10.3
9	0.0	208.2	4610	280.6	0.000	0.0	0.0	4.37	96.9	5.9
10	0.0	323.7	10751	152.8	0.000	0.0	0.0	6.27	208.4	3.0
11	0.0	53.7	781	4.1	.070	0.0	I	R	R	R
12	0.0	510.8	764	1.6	.120	0.0	I	R	R	R
13	0.0	424.3	16491	424.5	.025	2.8	0.0	3.85	149.4	3.8
14	0.0	345.2	13281	427.1	.055	5.6	0.0	3.36	129.3	4.2
15	0.0	212.6	5547	704.3	.035	3.2	0.0	2.31	60.3	7.7
16	0.0	143.0	4064	601.1	.060	5.0	0.0	1.71	48.6	7.2
17	0.0	203.7	1825	566.6	.060	3.4	0.0	3.59	32.2	10.0
18	0.0	112.8	1573	160.1	0.000	0.0	0.0	3.97	55.4	5.6
19	0.0	92.3	1359	92.2	.065	1.2	0.0	4.81	70.9	4.8
20	0.0	64.9	1130	47.7	0.000	0.0	0.0	7.06	122.9	5.2
21	0.0	67.0	1296	30.9	0.000	0.0	0.0	17.39	336.3	8.0
22	0.0	59.7	767	5.0	.080	0.0	I	R	R	R
23	0.0	1045.3	482	3.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	8.934	GRAM/BHP HR
	CO	89.735	GRAM/BHP HR
	NO2	6.553	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.691	LB/BHP HR

TABLE D-23 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-00 TEST-34 RUN-2 1972 STANDARD ENGINE 06-18-73

								DRY CONCENTRATION			
MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	HC	CO	CO2	NO
1	700	0.0	0	18.3	5.7	14.9	0	2773	2.330	11.92	70
2	1200	4.2	1	19.8	8.2	14.6	0	2326	1.860	12.72	100
3	1200	15.8	4	18.7	8.8	15.0	0	1924	1.390	12.86	130
4	1200	40.3	9	16.8	10.5	15.7	0	1554	.610	13.00	235
5	1200	56.0	13	15.7	12.0	15.0	0	2070	1.480	12.72	335
6	1200	112.0	26	11.6	16.1	14.9	0	2172	1.190	13.00	1000
7	1200	168.0	38	5.8	22.0	14.7	0	2323	.990	13.43	1512
8	1200	185.5	42	4.1	22.5	14.8	0	2293	.590	13.73	1863
9	1200	208.3	48	1.9	28.3	13.5	0	2777	3.660	12.05	900
10	1200	225.8	52	.3	32.5	12.2	0	3881	6.350	10.80	338
11	700	0.0	0	18.5	5.6	15.0	0	2827	2.370	11.79	75
12	1200	0.0	0	22.3	5.8	15.5	0	29425	2.250	9.23	25
13	2300	252.0	110	1.0	59.3	12.6	0	2584	5.030	11.04	795
14	2300	234.5	103	2.4	53.3	13.0	0	2460	4.050	11.53	985
15	2300	210.0	92	3.5	47.2	14.5	0	1101	1.410	12.59	1462
16	2300	190.8	84	4.6	44.2	14.5	0	1046	1.500	12.59	1263
17	2300	129.5	57	11.5	30.8	14.7	0	2115	.950	12.86	1688
18	2300	64.8	28	16.3	21.8	14.7	0	1694	1.150	12.80	688
19	2300	43.8	19	17.6	19.3	14.7	0	1524	1.140	12.80	500
20	2300	21.0	9	19.3	16.1	14.7	0	1355	1.130	12.80	275
21	2300	8.8	4	20.2	14.4	14.4	0	1640	1.560	12.59	190
22	700	0.0	0	16.8	5.5	15.2	0	3230	1.830	11.53	85
23	2300	0.0	0	23.8	5.7	16.8	0	50536	1.110	6.53	50

	CALCULATED GRAM/HR						BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	ALDE.	HC	CO	NO2
1	0.0	49.4	838	4.1	.070	0.0	I	R	R	R
2	0.0	58.4	943	8.3	.060	.1	0.0	60.88	983.1	8.7
3	0.0	53.2	776	11.9	.060	.2	0.0	14.73	215.0	3.3
4	0.0	53.8	426	27.0	.050	.5	0.0	5.84	46.3	2.9
5	0.0	78.2	1130	42.0	.030	.4	0.0	6.11	88.3	3.3
6	0.0	110.1	1218	168.3	.060	1.5	0.0	4.30	47.6	6.6
7	0.0	158.2	1362	341.9	0.000	0.0	0.0	4.12	35.5	8.9
8	0.0	160.9	836	433.9	.040	1.7	0.0	3.80	19.7	10.2
9	0.0	223.0	5936	239.9	0.000	0.0	0.0	4.69	124.7	5.0
10	0.0	326.3	10782	94.3	0.000	0.0	0.0	6.32	209.0	1.8
11	0.0	49.7	842	4.4	.070	0.0	I	R	R	R
12	0.0	536.8	829	1.5	.120	0.0	I	R	R	R
13	0.0	425.7	16738	434.8	.025	2.8	0.0	3.86	151.7	3.9
14	0.0	375.8	12498	499.6	.055	5.6	0.0	3.66	121.7	4.9
15	0.0	167.1	4322	736.5	.035	3.2	0.0	1.82	47.0	8.0
16	0.0	147.7	4280	592.3	.060	5.0	0.0	1.77	51.2	7.1
17	0.0	210.7	1912	558.4	.060	3.4	0.0	3.72	33.7	9.8
18	0.0	118.6	1627	160.0	0.000	0.0	0.0	4.18	57.3	5.6
19	0.0	94.7	1431	103.1	.065	1.2	0.0	4.94	74.6	5.4
20	0.0	70.3	1185	47.4	0.000	0.0	0.0	7.65	128.9	5.2
21	0.0	74.8	1438	28.8	0.000	0.0	0.0	19.42	373.1	7.5
22	0.0	58.9	674	5.1	.080	0.0	I	R	R	R
23	0.0	1029.3	457	3.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	8.870	GRAM/BHP HR
	CO	89.121	GRAM/BHP HR
	NO2	6.730	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.697	LB/BHP HR

TABLE D-24 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-00 TEST-34 RUN-3 1972 STANDARD ENGINE 06-18-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.1	5.5	15.0	0	3155	2.170	11.53	63
2	1200	4.2	1	19.7	8.2	14.8	0	2032	1.640	12.31	100
3	1200	18.7	4	18.7	8.8	15.1	0	1720	1.360	12.45	130
4	1200	41.4	9	16.9	10.2	15.7	0	1656	.670	12.59	240
5	1200	56.0	13	16.5	11.6	14.6	0	2402	1.480	12.59	330
6	1200	114.3	26	10.8	16.1	14.8	0	2538	1.260	12.59	975
7	1200	168.2	38	6.1	21.3	14.9	0	2170	.780	13.00	1525
8	1200	184.8	42	4.8	22.0	14.9	0	2227	.680	13.14	1800
9	1200	207.7	47	1.8	26.7	14.1	0	2297	2.620	11.92	1000
10	1200	226.5	52	.3	29.9	12.9	0	3182	4.690	11.16	900
11	700	0.0	0	18.6	5.6	15.0	0	3667	2.580	11.28	75
12	1200	0.0	0	22.3	5.5	16.9	0	12832	2.660	8.82	25
13	2300	251.3	110	1.0	59.5	12.5	0	2678	5.390	11.04	510
14	2300	230.7	101	2.5	52.8	13.0	0	2608	4.050	11.79	690
15	2300	205.6	90	3.4	47.4	14.2	0	1505	1.790	12.86	1125
16	2300	189.0	83	4.7	43.5	14.2	0	1390	1.860	12.72	938
17	2300	126.7	55	11.3	31.0	14.4	0	2207	1.260	13.00	1138
18	2300	62.3	27	16.3	21.8	14.4	0	1756	1.360	13.00	488
19	2300	45.7	20	17.3	19.8	14.5	0	1614	1.310	13.00	380
20	2300	20.8	9	19.2	16.0	14.5	0	1414	1.190	13.00	210
21	2300	4.2	2	20.4	14.4	14.3	0	1474	1.430	13.00	130
22	700	0.0	0	17.0	5.6	15.3	0	3313	1.790	11.53	55
23	2300	0.0	0	23.8	5.5	16.7	0	40282	.930	6.78	63

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	56.2	780	3.7	.070	0.0	I	R	R	R
2	0.0	53.4	871	8.7	.060	.1	0.0	55.66	907.2	9.1
3	0.0	49.1	784	12.3	.060	.3	0.0	11.49	183.6	2.9
4	0.0	57.1	466	27.5	.050	.5	0.0	6.03	49.3	2.9
5	0.0	88.3	1099	40.3	.030	.4	0.0	6.90	85.9	3.1
6	0.0	131.4	1318	167.6	.060	1.6	0.0	5.03	50.5	6.4
7	0.0	149.8	1088	349.5	0.000	0.0	0.0	3.90	28.3	9.1
8	0.0	158.3	976	424.7	.040	1.7	0.0	3.75	23.1	10.1
9	0.0	188.4	4340	272.2	0.000	0.0	0.0	3.97	91.4	5.7
10	0.0	266.9	7947	250.6	0.000	0.0	0.0	5.16	153.6	4.8
11	0.0	65.5	931	4.4	.070	0.0	I	R	R	R
12	0.0	250.8	1050	1.6	.120	0.0	I	R	R	R
13	0.0	432.9	17598	273.7	.025	2.8	0.0	3.93	159.9	2.5
14	0.0	388.0	12169	340.8	.055	5.6	0.0	3.84	120.5	3.4
15	0.0	218.6	5253	542.6	.035	3.2	0.0	2.43	58.3	6.0
16	0.0	186.4	5037	417.5	.060	5.0	0.0	2.25	60.9	5.0
17	0.0	214.3	2472	366.9	.060	3.3	0.0	3.86	44.5	6.6
18	0.0	119.5	1869	110.2	0.000	0.0	0.0	4.38	68.5	4.0
19	0.0	100.1	1642	78.3	.065	1.3	0.0	5.00	82.1	3.9
20	0.0	71.6	1217	35.3	0.000	0.0	0.0	7.86	133.6	3.9
21	0.0	66.0	1294	19.3	0.000	0.0	0.0	35.90	703.7	10.5
22	0.0	61.7	673	3.4	.080	0.0	I	R	R	R
23	0.0	856.1	399	4.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	7.501	GRAM/BHP HR
	CO	96.053	GRAM/BHP HR
	NO2	5.059	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.696	LB/BHP HR

TABLE D-25. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 4-0 TEST 44 RUN-1 1973 CALIF ENGINE 06-28-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.3	5.9	16.5	0	18530	1.410	9.72	58
2	1200	5.3	1	19.8	7.2	16.7	0	15845	.470	9.88	80
3	1200	19.3	4	18.8	8.0	16.4	0	11714	.870	10.49	130
4	1200	42.0	10	17.6	9.5	16.1	0	2066	.860	11.76	285
5	1200	59.5	14	16.8	10.7	15.1	0	2468	1.030	12.15	465
6	1200	117.3	27	10.5	15.2	15.9	0	2038	.360	12.28	715
7	1200	176.8	40	4.2	21.7	15.2	0	1794	.420	12.68	1275
8	1200	192.5	44	3.4	22.6	15.1	0	1990	.560	12.55	1550
9	1200	215.3	49	2.3	25.6	14.2	0	2422	1.940	11.76	1450
10	1200	234.5	54	.3	32.2	12.1	0	3618	6.280	9.77	520
11	700	0.0	0	18.3	6.0	15.8	0	19352	1.570	9.19	60
12	1200	0.0	0	21.3	6.5	15.8	0	24090	2.330	7.94	30
13	2300	253.8	111	1.0	62.5	11.9	0	3427	6.420	9.99	655
14	2300	234.5	103	2.4	54.8	12.5	0	3006	4.980	10.70	630
15	2300	208.3	91	3.5	45.8	14.2	0	1651	1.680	12.31	1300
16	2300	190.8	84	4.5	43.3	14.1	0	1810	1.720	12.45	1087
17	2300	127.8	56	10.0	30.4	14.6	0	1760	1.000	12.72	840
18	2300	63.0	28	14.5	22.1	15.0	0	1322	.800	12.72	265
19	2300	45.5	20	15.7	20.0	15.1	0	1027	.720	12.72	210
20	2300	21.0	9	18.3	16.0	15.4	0	715	.590	12.59	180
21	2300	5.3	2	20.6	12.6	15.1	0	1047	.990	12.45	205
22	700	3.5	0	18.3	6.0	16.7	0	15863	1.540	9.44	55
23	2300	0.0	0	22.0	11.0	20.6	0	5712	1.570	11.41	75

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	382.0	587	4.0	.070	0.0	I	R	R	R
2	0.0	416.2	515	7.0	.060	.1	0.0	343.67	425.0	5.8
3	0.0	339.2	509	12.5	.060	.3	0.0	76.92	115.4	2.8
4	0.0	69.4	584	31.8	.050	.5	0.0	7.23	60.8	3.3
5	0.0	89.2	752	55.8	.030	.4	0.0	6.56	55.3	4.1
6	0.0	109.4	390	127.4	.060	1.6	0.0	4.08	14.6	4.8
7	0.0	133.0	629	313.8	0.000	0.0	0.0	3.29	15.6	7.8
8	0.0	153.3	871	396.4	.040	1.8	0.0	3.49	19.8	9.0
9	0.0	201.8	3264	400.9	0.000	0.0	0.0	4.10	66.3	8.2
10	0.0	322.0	11290	153.6	0.000	0.0	0.0	6.01	210.7	2.9
11	0.0	414.9	680	4.3	.070	0.0	I	R	R	R
12	0.0	560.2	1094	2.3	.120	0.0	I	R	R	R
13	0.0	579.9	21946	368.0	.025	2.8	0.0	5.22	197.5	3.3
14	0.0	467.5	15647	325.3	.055	5.6	0.0	4.55	152.4	3.2
15	0.0	242.3	4981	633.4	.035	3.2	0.0	2.66	54.6	6.9
16	0.0	247.7	4755	493.9	.060	5.0	0.0	2.96	56.9	5.9
17	0.0	174.7	2005	276.7	.060	3.4	0.0	3.12	35.8	4.9
18	0.0	97.1	1187	64.6	0.000	0.0	0.0	3.52	43.0	2.3
19	0.0	68.8	974	46.7	.065	1.3	0.0	3.45	48.9	2.3
20	0.0	39.1	653	32.7	0.000	0.0	0.0	4.26	71.0	3.6
21	0.0	44.2	844	28.7	0.000	0.0	0.0	19.03	363.6	12.4
22	0.0	343.6	674	4.0	.080	.0	0.0	736.46	1444.3	8.5
23	0.0	210.3	1168	9.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	11.799	GRAM/BHP HR
	CO	99.086	GRAM/BHP HR
	NO2	4.947	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.701	LB/BHP HR

TABLE D-26. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-0 TEST 44 RUN-2 1973 CALIF ENGINE 06-28-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.4	6.2	16.2	0	19137	1.560	9.23	55
2	1200	5.3	1	19.8	7.5	16.6	0	15093	1.110	9.88	75
3	1200	19.3	4	18.9	8.0	16.3	0	9860	1.100	10.56	110
4	1200	42.0	10	17.6	9.5	15.8	0	2066	.970	11.66	240
5	1200	59.5	14	16.9	10.6	15.1	0	2383	1.100	12.05	405
6	1200	117.3	27	10.6	15.0	16.0	0	2273	.330	12.18	625
7	1200	176.8	40	4.2	21.5	15.4	0	1763	.320	12.59	1212
8	1200	192.5	44	3.4	22.5	15.2	0	1904	.520	12.45	1512
9	1200	215.3	49	2.3	25.5	14.3	0	2342	1.860	12.05	1400
10	1200	234.5	54	.3	32.1	12.1	0	3569	6.480	9.88	515
11	700	0.0	0	18.3	6.1	15.7	0	16409	2.310	9.44	55
12	1200	0.0	0	21.3	6.4	15.8	0	23255	2.450	8.03	35
13	2300	253.8	111	1.0	62.5	12.0	0	3805	6.350	10.21	680
14	2300	234.5	103	2.4	54.2	12.8	0	2686	4.310	11.16	770
15	2300	208.3	91	3.4	46.0	14.3	0	1580	1.460	12.45	1287
16	2300	190.8	84	4.5	43.0	14.2	0	1835	1.510	12.45	1025
17	2300	127.8	56	10.4	30.6	14.7	0	1912	.860	12.59	805
18	2300	63.0	28	14.4	22.1	15.0	0	1207	.720	12.59	260
19	2300	45.5	20	15.3	19.8	15.2	0	997	.620	12.59	205
20	2300	21.0	9	18.6	15.8	15.4	0	896	.540	12.45	200
21	2300	5.3	2	20.6	12.7	15.3	0	1018	.890	12.31	205
22	700	0.0	0	18.4	6.1	16.2	0	16212	1.680	9.44	55
23	2300	0.0	0	22.0	10.7	20.8	0	7159	1.540	11.28	70

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	423.6	698	4.0	.070	0.0	I	R	R	R
2	0.0	410.8	610	6.8	.060	.1	0.0	339.22	504.0	5.6
3	0.0	282.9	638	10.5	.060	.3	0.0	64.16	144.6	2.4
4	0.0	69.4	658	26.7	.050	.5	0.0	7.23	68.5	2.8
5	0.0	85.6	798	48.3	.030	.4	0.0	6.30	58.7	3.6
6	0.0	121.4	356	110.8	.060	1.6	0.0	4.53	13.3	4.1
7	0.0	131.4	482	299.9	0.000	0.0	0.0	3.25	11.9	7.4
8	0.0	147.7	815	389.3	.040	1.8	0.0	3.36	18.5	8.9
9	0.0	191.5	3073	380.1	0.000	0.0	0.0	3.89	62.5	7.7
10	0.0	310.9	11401	148.9	0.000	0.0	0.0	5.80	212.8	2.8
11	0.0	339.1	964	3.8	.070	0.0	I	R	R	R
12	0.0	527.2	1122	2.6	.120	0.0	I	R	R	R
13	0.0	636.8	21466	377.8	.025	2.8	0.0	5.73	193.1	3.4
14	0.0	419.6	13600	399.3	.055	5.6	0.0	4.09	132.4	3.9
15	0.0	234.4	4374	633.7	.035	3.2	0.0	2.57	48.0	6.9
16	0.0	253.0	4206	469.3	.060	5.0	0.0	3.03	50.3	5.6
17	0.0	194.5	1768	271.9	.060	3.4	0.0	3.48	31.6	4.9
18	0.0	90.1	1086	64.4	0.000	0.0	0.0	3.27	39.3	2.3
19	0.0	67.2	845	45.9	.065	1.3	0.0	3.37	42.4	2.3
20	0.0	49.1	598	36.4	0.000	0.0	0.0	5.34	65.0	4.0
21	0.0	44.1	779	29.5	0.000	0.0	0.0	18.99	335.5	12.7
22	0.0	352.1	737	4.0	.080	0.0	I	R	R	R
23	0.0	256.7	1115	8.3	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	11.573	GRAM/BHP HR
	CO	93.267	GRAM/BHP HR
	NO2	4.976	GRAM/BHP HR
	ALDE	0.000	GRAN/BHP HR
	BSFC	.701	LB/BHP HR

TABLE D-27. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-0 TEST 44 RUN-3 1973 CALIF ENGINE 06-29-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.2	5.9	16.3	0	21051	1.190	9.23	50
2	1200	5.3	1	19.8	7.3	16.4	0	16285	.970	9.88	70
3	1200	19.3	4	19.0	8.1	16.0	0	7775	.930	11.04	105
4	1200	42.0	10	17.5	9.6	15.9	0	2180	.840	11.92	240
5	1200	59.5	14	16.9	10.7	15.0	0	2639	1.130	12.18	340
6	1200	117.3	27	10.5	15.5	15.9	0	2166	.320	12.45	570
7	1200	176.8	40	4.2	21.8	15.4	0	1797	.280	13.00	1150
8	1200	192.5	44	3.2	22.7	15.2	0	1826	.620	12.72	1300
9	1200	215.3	49	2.3	25.9	14.4	0	2453	1.510	12.31	1225
10	1200	234.5	54	.3	32.6	12.2	0	3566	6.150	10.10	520
11	700	0.0	0	18.4	6.0	15.8	0	13782	2.170	9.88	50
12	1200	0.0	0	21.3	6.6	15.1	0	23177	2.330	7.75	35
13	2300	253.8	111	1.0	62.3	12.0	0	3289	6.480	10.17	590
14	2300	234.5	103	2.3	54.3	12.3	0	2990	5.680	10.54	460
15	2300	208.3	91	3.3	46.1	14.4	0	1546	1.150	12.28	1150
16	2300	190.8	84	4.4	43.1	14.3	0	1664	1.150	12.68	1000
17	2300	127.8	56	10.0	30.6	14.7	0	1897	.750	12.68	770
18	2300	63.0	28	14.3	22.1	15.0	0	1192	.590	12.68	240
19	2300	45.5	20	15.5	19.7	15.1	0	954	.550	12.68	195
20	2300	21.0	9	18.5	15.7	15.4	0	714	.450	12.50	175
21	2300	5.3	2	20.4	13.0	15.3	0	882	.640	12.28	170
22	700	0.0	0	18.5	5.8	16.8	0	13642	1.330	9.50	55
23	2300	0.0	0	22.1	10.8	20.6	0	7041	1.430	11.28	70

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	449.8	514	3.5	.070	0.0	I	R	R	R
2	0.0	432.1	520	6.2	.060	.1	0.0	356.86	429.4	5.1
3	0.0	224.1	541	10.0	.060	.3	0.0	50.82	122.8	2.3
4	0.0	73.2	569	26.7	.050	.5	0.0	7.62	59.3	2.8
5	0.0	94.4	816	40.4	.030	.4	0.0	6.94	60.0	3.0
6	0.0	117.3	350	102.5	.060	1.6	0.0	4.37	13.1	3.8
7	0.0	132.0	416	280.5	0.000	0.0	0.0	3.27	10.3	6.9
8	0.0	139.0	954	328.6	.040	1.8	0.0	3.16	21.7	7.5
9	0.0	204.9	2548	339.7	0.000	0.0	0.0	4.17	51.8	6.9
10	0.0	317.5	11062	153.7	0.000	0.0	0.0	5.93	206.5	2.9
11	0.0	279.3	888	3.4	.070	0.0	I	R	R	R
12	0.0	559.7	1137	2.8	.120	0.0	I	R	R	R
13	0.0	547.4	21786	326.0	.025	2.8	0.0	4.93	196.0	2.9
14	0.0	445.8	17108	227.7	.055	5.6	0.0	4.34	166.6	2.2
15	0.0	237.9	3576	587.7	.035	3.2	0.0	2.61	39.2	6.4
16	0.0	232.4	3245	463.7	.060	5.0	0.0	2.78	38.8	5.5
17	0.0	193.3	1544	260.5	.060	3.4	0.0	3.45	27.6	4.7
18	0.0	89.3	892	59.7	0.000	0.0	0.0	3.24	32.3	2.2
19	0.0	64.0	745	43.4	.065	1.3	0.0	3.21	37.4	2.2
20	0.0	39.1	497	31.8	0.000	0.0	0.0	4.25	54.1	3.5
21	0.0	40.0	586	25.6	0.000	0.0	0.0	17.23	252.5	11.0
22	0.0	294.3	580	3.9	.080	0.0	I	R	R	R
23	0.0	257.1	1055	8.5	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	11.278	GRAM/BHP HR
	CO	95.309	GRAM/BHP HR
	NO2	4.327	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.702	LB/BHP HR

TABLE D-28. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-1 TEST-40 RUN-1 EGR-AIR-CAT 06-26-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.3	6.1	22.8	0	1423	.040	9.02	30
2	1200	5.3	1	19.8	7.8	23.9	0	1768	.030	8.62	50
3	1200	17.5	4	18.8	8.9	23.0	0	893	.020	8.92	30
4	1200	40.3	9	17.4	10.0	22.0	0	163	.020	9.44	75
5	1200	56.0	13	16.8	11.0	20.7	0	178	.050	9.99	215
6	1200	113.8	26	6.3	18.9	18.7	0	110	.030	11.04	365
7	1200	169.8	39	3.5	22.4	18.1	0	159	.020	11.28	950
8	1200	185.6	42	2.7	22.9	17.7	0	159	.050	11.41	1125
9	1200	208.4	48	2.3	26.7	16.2	0	154	.110	12.45	1062
10	1200	227.6	52	0.0	33.0	13.9	0	448	2.130	12.72	95
11	700	0.0	0	18.4	6.1	22.1	0	978	.040	9.33	55
12	1200	0.0	0	22.0	6.5	31.1	0	725	.020	7.94	20
13	2300	246.9	108	0.0	62.3	13.8	0	299	2.170	12.72	270
14	2300	225.9	99	2.3	55.9	14.4	0	128	.830	13.14	350
15	2300	203.1	89	3.0	46.4	16.4	0	14	.020	12.31	1025
16	2300	185.6	81	4.1	44.1	16.7	0	14	.010	12.05	920
17	2300	122.6	54	9.4	30.8	18.1	0	42	.010	12.05	615
18	2300	61.2	27	13.0	23.0	19.7	0	42	.010	10.92	175
19	2300	43.8	19	14.8	20.4	20.6	0	42	.080	10.21	145
20	2300	19.3	8	17.7	16.3	21.8	0	109	.080	9.88	95
21	2300	5.3	2	19.5	14.4	22.8	0	109	.080	9.23	80
22	700	0.0	0	18.5	6.0	23.6	0	1417	.080	7.84	110
23	2300	0.0	0	22.0	12.5	27.0	0	122	.020	8.52	35

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	42.8	24	3.0	.070	0.0	I	R	R	R
2	0.0	70.9	24	6.7	.060	.1	0.0	58.52	20.1	5.5
3	0.0	39.9	18	4.5	.060	.2	0.0	9.99	4.5	1.1
4	0.0	7.8	19	11.9	.050	.5	0.0	.85	2.1	1.3
5	0.0	8.8	50	35.4	.030	.4	0.0	.69	3.9	2.8
6	0.0	8.5	47	93.8	.060	1.6	0.0	.33	1.8	3.6
7	0.0	14.3	36	283.2	0.000	0.0	0.0	.37	.9	7.3
8	0.0	14.4	91	338.1	.040	1.7	0.0	.34	2.2	8.0
9	0.0	14.8	214	339.6	0.000	0.0	0.0	.31	4.5	7.1
10	0.0	45.0	4324	31.7	0.000	0.0	0.0	.87	83.1	.6
11	0.0	28.6	24	5.3	.070	0.0	I	R	R	R
12	0.0	26.6	15	2.4	.120	0.0	I	R	R	R
13	0.0	56.7	8302	169.8	.025	2.7	0.0	.52	76.8	1.6
14	0.0	23.1	3040	210.7	.055	5.4	0.0	.23	30.7	2.1
15	0.0	2.5	69	580.8	.035	3.1	0.0	.03	.8	6.5
16	0.0	2.4	34	506.6	.060	4.9	0.0	.03	.4	6.2
17	0.0	4.9	23	236.4	.060	3.2	0.0	.09	.4	4.4
18	0.0	4.0	19	55.4	0.000	0.0	0.0	.15	.7	2.1
19	0.0	3.7	145	43.3	.065	1.2	0.0	.20	7.6	2.3
20	0.0	8.1	120	23.4	0.000	0.0	0.0	.96	14.2	2.8
21	0.0	7.6	113	18.6	0.000	0.0	0.0	3.28	48.8	8.0
22	0.0	47.8	55	12.3	.080	0.0	I	R	R	R
23	0.0	8.1	27	7.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.973	GRAM/BHP HR
	CO	16.495	GRAM/BHP HR
	NO2	4.292	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	HSFC	.752	LB/BHP HR

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                TABLE D-29.  MASS EMISSIONS BY 23 MODE PROCEDURE
                ENGINE 4-1   TEST-40  RUN-2   EGR-AIR-CAT                  06-26-73
--------------------------------------------------------------------------------------
              DYNA.         MAN.  FUEL     A/F               DRY CONCENTRATION
MODE SPEED     LOAD    HP   VAC. LB/HR   RATIO   ALDE.    HC       CO       CO2     NO
--------------------------------------------------------------------------------------
  1    700      0.0     0   18.2    6.1   22.6       0  1354     .040      8.92     30
  2   1200      5.3     1   19.6    8.2   23.7       0  1511     .030      8.52     30
  3   1200     17.5     4   18.8    8.6   22.9       0  1028     .020      8.82     35
  4   1200     40.3     9   17.5   10.0   21.6       0   157     .020      9.44    110
  5   1200     56.0    13   16.9   11.4   20.5       0   164     .050      9.88    230
  6   1200    113.8    26    6.3   18.8   18.6       0    97     .030     10.92    390
  7   1200    169.8    39    3.5   22.5   18.0       0   131     .020     11.28    987
  8   1200    185.6    42    2.7   23.2   17.6       0   132     .050     11.53   1125
  9   1200    208.4    48    2.1   26.5   16.1       0   126     .110     12.45   1037
 10   1200    227.8    52    0.0   33.1   13.9       0   532    2.130     12.45    120
 11    700      0.0     0   18.3    6.1   21.6       0   810     .040      9.55     60
 12   1200      0.0     0   22.0    6.4   32.1       0   607     .020      7.12     20
 13   2300    246.9   108    0.0   62.8   13.8       0   306    2.170     12.59    305
 14   2300    225.9    99    2.5   51.8   14.9       0    28     .830     13.14    505
 15   2300    203.1    89    3.0   46.5   16.4       0     8     .020     12.31    975
 16   2300    185.6    81    4.1   44.5   16.7       0     8     .010     12.18    850
 17   2300    122.6    54    9.2   31.0   18.4       0    42     .010     11.04    555
 18   2300     61.2    27   13.2   23.2   20.1       0    55     .010     10.33    180
 19   2300     43.8    19   14.9   20.5   20.8       0    55     .080      9.99    135
 20   2300     19.3     8   17.7   16.2   22.4       0    54     .080      9.23     95
 21   2300      5.3     2   14.7   13.9   22.5       0   103     .080      9.88     85
 22    700      0.0     0   18.4    6.0   22.3       0  1262     .040      9.12    120
 23   2300      0.0     0   22.0   12.4   27.1       0   182     .020      8.52     35
--------------------------------------------------------------------------------------
          CALCULATED GRAM/HR          WT.      WT.  BRAKE SPECIFIC GRAM/BHP-HR
MODE ALDE.     HC       CO     NO2   FAC.      HP  ALDE.      HC      CO     NO2
--------------------------------------------------------------------------------------
  1   0.0     41.2      25     3.0   .070     0.0      I       R       R       R
  2   0.0     64.6      26     4.3   .060      .1    0.0   53.33    21.4     3.5
  3   0.0     44.8      18     5.1   .060      .2    0.0   11.21     4.4     1.3
  4   0.0      7.5      19    17.5   .050      .5    0.0     .81     2.1     1.9
  5   0.0      8.5      53    39.7   .030      .4    0.0     .67     4.1     3.1
  6   0.0      7.5      47   100.7   .060     1.6    0.0     .29     1.8     3.9
  7   0.0     11.9      36   295.6  0.000     0.0    0.0     .31      .9     7.6
  8   0.0     12.0      92   339.0   .040     1.7    0.0     .28     2.2     8.0
  9   0.0     12.1     212   329.2  0.000     0.0    0.0     .25     4.5     6.9
 10   0.0     54.6    4415    40.9  0.000     0.0    0.0    1.05    84.8      .8
 11   0.0     23.2      23     5.7   .070     0.0      I       R       R       R
 12   0.0     24.5      16     2.7   .120     0.0      I       R       R       R
 13   0.0     58.9    8442   195.0   .025     2.7    0.0     .54    78.1     1.8
 14   0.0      4.7    2819   281.9   .055     5.4    0.0     .05    28.5     2.8
 15   0.0      1.3      69   553.7   .035     3.1    0.0     .01      .8     6.2
 16   0.0      1.3      33   467.3   .060     4.9    0.0     .02      .4     5.7
 17   0.0      5.3      26   234.4   .060     3.2    0.0     .10      .5     4.4
 18   0.0      5.6      21    60.8  0.000     0.0    0.0     .21      .8     2.3
 19   0.0      5.0     149    41.4   .065     1.2    0.0     .26     7.8     2.2
 20   0.0      4.3     127    24.9  0.000     0.0    0.0     .51    15.1     2.9
 21   0.0      6.5     102    17.8  0.000     0.0    0.0    2.80    44.0     7.7
 22   0.0     37.0      24    11.7   .080     0.0      I       R       R       R
 23   0.0     12.0      27     7.6   .060     0.0      I       R       R       R

CYCLE COMPOSITE    HC       .869    GRAM/BHP HR
                   CO     16.079    GRAM/BHP HR
                   NO2     4.362    GRAM/BHP HR
                   ALDE    0.000    GRAM/BHP HR
                   BSFC     .746      LB/BHP HR
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TABLE D-30. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 4-1 TEST-40 RUN-3 EGR-AIR-CAT 06-26-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	18.2	6.2	23.2	0	1620	.050	8.62	85
2	1200	5.3	1	19.7	7.9	24.5	0	1732	.040	8.13	40
3	1200	17.5	4	18.7	9.2	23.4	0	756	.040	8.62	35
4	1200	40.3	9	17.6	10.2	21.5	0	142	.050	9.33	110
5	1200	56.0	13	16.9	11.2	21.0	0	183	.050	9.55	200
6	1200	113.8	26	6.2	18.9	18.9	0	89	.030	10.50	395
7	1200	169.8	39	3.6	22.3	18.2	0	124	.020	10.90	910
8	1200	185.6	42	2.7	23.0	17.8	0	117	.050	11.04	1100
9	1200	208.4	48	2.1	26.1	16.1	0	132	.140	11.92	1037
10	1200	227.8	52	0.0	33.4	13.8	0	531	2.290	11.92	130
11	700	0.0	0	18.3	6.0	21.6	0	712	.050	9.23	55
12	1200	0.0	0	22.0	6.5	30.4	0	725	.020	8.03	50
13	2300	246.9	108	0.0	62.7	13.8	0	297	2.130	12.05	350
14	2300	225.9	99	2.5	55.4	15.0	0	63	.300	12.45	545
15	2300	203.1	89	3.1	46.3	16.7	0	14	.020	11.66	987
16	2300	185.6	81	4.0	44.2	16.8	0	14	.020	11.53	862
17	2300	122.6	54	9.5	31.0	18.6	0	42	.020	10.56	590
18	2300	61.2	27	13.3	23.2	20.3	0	48	.010	9.77	180
19	2300	43.8	19	15.0	20.5	21.1	0	54	.010	9.44	140
20	2300	19.3	8	17.9	16.0	22.9	0	41	.010	8.82	95
21	2300	5.3	2	19.3	14.4	23.6	0	60	.010	8.62	80
22	700	0.0	0	18.3	6.1	22.6	0	1136	.030	8.82	110
23	2300	0.0	0	22.0	12.4	27.1	0	189	.020	8.42	35

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	51.6	32	9.0	.070	0.0	I	R	R	R
2	0.0	74.4	35	5.7	.060	.1	0.0	61.42	28.7	4.7
3	0.0	36.1	39	5.6	.060	.2	0.0	9.03	9.7	1.4
4	0.0	7.0	50	18.0	.050	.5	0.0	.76	5.4	2.0
5	0.0	9.7	53	35.1	.030	.4	0.0	.76	4.2	2.7
6	0.0	7.2	49	106.7	.060	1.6	0.0	.28	1.9	4.1
7	0.0	11.5	37	279.5	0.000	0.0	0.0	.30	1.0	7.2
8	0.0	11.0	95	343.2	.040	1.7	0.0	.26	2.2	8.1
9	0.0	13.0	277	337.6	0.000	0.0	0.0	.27	5.8	7.1
10	0.0	56.4	4914	45.8	0.000	0.0	0.0	1.08	94.4	.9
11	0.0	20.7	29	5.3	.070	0.0	I	R	R	R
12	0.0	26.3	15	6.0	.120	0.0	I	R	R	R
13	0.0	59.5	8612	232.6	.025	2.7	0.0	.55	79.6	2.2
14	0.0	12.3	1194	356.4	.055	5.4	0.0	.12	12.1	3.6
15	0.0	2.6	73	589.1	.035	3.1	0.0	.03	.8	6.6
16	0.0	2.5	70	496.7	.060	4.9	0.0	.03	.9	6.1
17	0.0	5.5	54	260.2	.060	3.2	0.0	.10	1.0	4.8
18	0.0	5.2	22	64.3	0.000	0.0	0.0	.19	.8	2.4
19	0.0	5.3	20	45.7	.065	1.2	0.0	.28	1.0	2.4
20	0.0	3.4	17	25.9	0.000	0.0	0.0	.40	2.0	3.1
21	0.0	4.6	15	20.1	0.000	0.0	0.0	1.97	6.6	8.7
22	0.0	35.1	19	11.3	.080	0.0	I	R	R	R
23	0.0	12.5	27	7.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.920	GRAM/BHP HR
	CO	12.657	GRAM/BHP HR
	NO2	4.808	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.754	LB/BHP HR

TABLE D-31 VEHICLE EMISSION RESULTS

UNIT NO. 4-1 TEST NO. 1
VEHICLE MODEL LOADSTAR 1600 VAN
DATE 7/31/73
ENGINE 4-1 CID *
MFGR. CODE 4
CURB WT. 10,790
LA-4 DYNO TEST WEIGHT 16,000
YR. 1972
GVW 22,500

BAROMETER 29.20 IN.HG.
DRY BULB TEMP. 74.0 DEG. F
REL. HUMIDITY 58 PCT.
WET BULB TEMP 64.0 DEG. F
SP. HUMIDITY 74.5 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 13.0 IN. H2O
BLOWER INLET PRESS., G1 7.8 IN. H2O
BLOWER INLET TEMP. 125 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	9666	16562	9671
HC SAMPLE METER READING/SCALE	39.7/3	5.4/3	15.0/3
HC SAMPLE PPM	397	54	150
HC BACKGRD METER READING/SCALE	2.7/3	2.5/3	2.1/3
HC BACKGRD PPM	27	25	21
CO SAMPLE METER READING/SCALE	77.2/2	21.3/2	68.8/2
CO SAMPLE PPM	3052	651	2606
CO BACKGRD METER READING/SCALE	0.0/2	.2/2	.1/2
CO BACKGRD PPM	0	6	3
CO2 SAMPLE METER READING/SCALE	51.3/2	36.1/2	48.5/2
CO2 SAMPLE PERCENT	1.45	.98	1.36
CO2 BACKGRD METER READING/SCALE	1.9/2	2.5/2	2.5/2
CO2 BACKGRD PERCENT	.05	.06	.06
NOX SAMPLE METER READING/SCALE	17.8/3	10.0/3	17.9/3
NOX SAMPLE PPM	53.4	30.0	53.7
NOX BACKGRD METER READING/SCALE	.5/3	.8/3	.3/3
NOX BACKGRD PPM	1.5	2.4	.9
HC CONCENTRATION PPM	374	31	132
CO CONCENTRATION PPM	2910	622	2486
CO2 CONCENTRATION PCT	1.41	.92	1.31
NOX CONCENTRATION PPM	52.1	27.8	52.9
HC MASS GRAMS	31.48	4.47	11.09
CO MASS GRAMS	494.47	181.24	423.10
CO2 MASS GRAMS	3792.26	4252.24	3515.91
NOX MASS GRAMS	14.52	13.27	14.76

WEIGHTED MASS HC	3.24 GRAMS/MILE
WEIGHTED MASS CO	84.70 GRAMS/MILE
WEIGHTED MASS CO2	1051.60 GRAMS/MILE
WEIGHTED MASS NOX	3.72 GRAMS/MILE

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                    TABLE  D-32            VEHICLE EMISSION RESULTS

UNIT NO.  4-1        TEST NO. 2          DATE  8/ 1/73                  MFGR. CODE  4                  YR.  1972
VEHICLE MODEL  LOADSTAR 1600 VAN         ENGINE 4-1   CID *             CURB WT.     10,790            GVW  22,500
                                                                        LA-4 DYNO TEST WEIGHT 16,000

BAROMETER  29.20 IN.HG.                                               WET BULB TEMP 64.0 DEG. F
DRY BULB TEMP.  75.0 DEG. F                                            SP. HUMIDITY  72.8 GRAINS/LB
REL. HUMIDITY     55 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                    1              2
     FINAL WT.,   GRAMS                       -0.00          -0.00
     INITIAL WT., GRAMS                       -0.00          -0.00
     DIFFERENCE   GRAMS                        0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                        0.00 GRAMS

EXHAUST EMISSIONS

                                                                  BLOWER INLET PRESS., G1   7.8 IN. H2O
     BLOWER DIF. PRESS., G2,  12.5 IN. H2O                        BLOWER INLET TEMP.  125 DEG. F

     BAG RESULTS
     BAG NO.                                     1              2              3
     BLOWER REVOLUTIONS                        9666          16508           9773
     HC   SAMPLE  METER READING/SCALE        42.8/3          8.5/3         14.1/3
     HC   SAMPLE  PPM                          428             85            141
     HC   BACKGRD METER READING/SCALE         3.9/3          4.9/3          3.5/3
     HC   BACKGRD PPM                           39             49             35
     CO   SAMPLE  METER READING/SCALE        82.1/2         22.7/2         75.2/2
     CO   SAMPLE  PPM                         3332            698           2943
     CO   BACKGRD METER READING/SCALE         1.2/2          1.6/2          1.2/2
     CO   BACKGRD PPM                           34             45             34
     CO2  SAMPLE  METER READING/SCALE        75.6/2         58.2/2         69.0/2
     CO2  SAMPLE  PERCENT                     2.29           1.68           2.05
     CO2  BACKGRD METER READING/SCALE        11.5/2         12.3/2          7.3/2
     CO2  BACKGRD PERCENT                      .29            .31            .18
     NOX  SAMPLE  METER READING/SCALE        17.3/3         10.5/3         15.5/3
     NOX  SAMPLE  PPM                         51.9           31.5           46.5
     NOX  BACKGRD METER READING/SCALE          .1/3           .2/3           .1/3
     NOX  BACKGRD PPM                           .3             .6             .3

     HC   CONCENTRATION PPM                    397             42            112
     CO   CONCENTRATION PPM                   3099            625           2747
     CO2  CONCENTRATION PCT                   2.06           1.41           1.90
     NOX  CONCENTRATION PPM                   51.7           31.0           46.3
     HC   MASS GRAMS                         33.49           6.12           9.57
     CO   MASS GRAMS                        520.14         181.81         473.29
     CO2  MASS GRAMS                       5540.26        6465.64        5175.05
     NOX  MASS GRAMS                         14.31          14.66          12.96

     WEIGHTED MASS HC        3.46 GRAMS/MILE
     WEIGHTED MASS CO     [illegible] GRAMS/MILE
     WEIGHTED MASS CO2    1573.03 GRAMS/MILE
     WEIGHTED MASS NOX       3.76 GRAMS/MILE
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                         TABLE  D-33            VEHICLE EMISSION RESULTS

UNIT NO.  4-0        TEST NO. 3          DATE  8/ 2/73                 MFGR. CODE  4                    YR.  1972
VEHICLE MODEL  LOADSTAR 1600  VAN        ENGINE 4-0   CID *            CURB WT.      10,790             GVW  22,500
                                                                       LA-4 DYNO TEST WEIGHT 16,000
BAROMETER  29.22 IN.HG.
DRY BULB TEMP.  74.0 DEG. F                                       WET BULB TEMP 63.0 DEG. F
REL. HUMIDITY      54 PCT.                                         SP. HUMIDITY  69.6 GRAINS/LB

EVAPORATIVE EMISSIONS

     CANISTER                                       1               2
     FINAL WT.,    GRAMS                         -0.00           -0.00
     INITIAL WT., GRAMS                          -0.00           -0.00
     DIFFERENCE    GRAMS                          0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                                 0.00 GRAMS

EXHAUST EMISSIONS

     BLOWER DIF. PRESS., G2,  12.5 IN. H2O                             BLOWER INLET PRESS., G1   7.8 IN. H2O
                                                                       BLOWER INLET TEMP.  110 DEG. F
     BAG RESULTS
     BAG NO.                                        1               2               3
     BLOWER REVOLUTIONS                           9608           16520            9689
     HC    SAMPLE   METER READING/SCALE           46.1/3          30.6/3          50.0/3
     HC    SAMPLE   PPM                           461             306             500
     HC    BACKGRD METER READING/SCALE            2.1/3           3.9/3           2.9/3
     HC    BACKGRD PPM                            21              39              29
     CO    SAMPLE   METER READING/SCALE           62.3/1          73.3/2          59.3/1
     CO    SAMPLE   PPM                           7283            2840            6615
     CO    BACKGRD METER READING/SCALE            1.1/2            .4/2            .7/2
     CO    BACKGRD PPM                            31              11              20
     CO2   SAMPLE   METER READING/SCALE           60.0/2          40.9/2          57.5/2
     CO2   SAMPLE   PERCENT                       1.74            1.13            1.66
     CO2   BACKGRD METER READING/SCALE            2.0/2           1.9/2           1.8/2
     CO2   BACKGRD PERCENT                        .05             .05             .04
     NOX   SAMPLE   METER READING/SCALE           21.7/3          10.8/3          21.9/3
     NOX   SAMPLE   PPM                           65.1            32.4            65.7
     NOX   BACKGRD METER READING/SCALE             .1/3            .2/3            .3/3
     NOX   BACKGRD PPM                             .3              .6              .9

     HC    CONCENTRATION PPM                      444             271             476
     CO    CONCENTRATION PPM                      6886            2719            6272
     CO2   CONCENTRATION PCT                      1.70            1.08            1.62
     NOX   CONCENTRATION PPM                      64.9            31.9            65.0
     HC    MASS GRAMS                             81.35           40.18           41.37
     CO    MASS GRAMS                           1198.15          813.41         1100.48
     CO2   MASS GRAMS                           4671.86         5120.36         4487.49
     NOX   MASS GRAMS                             18.07           15.27           18.26

     WEIGHTED MASS HC      13.17 GRAMS/MILE
     WEIGHTED MASS CO     260.79 GRAMS/MILE
     WEIGHTED MASS CO2   1291.62 GRAMS/MILE
     WEIGHTED MASS NOX      4.46 GRAMS/MILE
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APPENDIX E

TASK 5 - ENGINE 5

MASS EMISSION RESULTS BY:
NINE MODE FTP
NINE MODE EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY
1975 LIGHT DUTY FTP

TABLE E-1. COMPOSITE EMISSIONS FOR ENGINE 5

NINE-MODE FTP

				HC		CO	NO_2		
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	BSFC
38	1	6-22	5-00	6.41	9.94	123	8.18	6.46	.726
38	2	6-22	5-00	6.59	10.63	111	8.42	6.85	.726
38	3	6-22	5-00	6.24	9.64	108	8.24	7.31	.729
		AVERAGE		6.4	10.1	114	8.3	6.9	.727
32	1	6-22	5-0	6.32	10.47	97	10.24	9.30	.711
32	2	6-22	5-0	6.98	10.34	112	9.75	8.67	.711
32	3	6-22	5-0	6.94	10.38	110	9.87	8.56	.711
		AVERAGE		6.7	10.4	106	10.0	8.8	.711
21	1	5-21	5-OX	6.36	8.07	58.5	9.13	8.43	.674
21	2	5-22	5-OX	6.16	8.35	64.8	8.49	7.80	.674
21	4	5-22	5-OX	6.43	8.55	62.7	8.25	8.02	.674
		AVERAGE		6.3	8.3	62	8.6	8.1	.674
24	1	5-29	5-1	.61	.30	2.19	---	---	.814
24	2	5-29	5-1	.55	.23	2.50	3.94	3.76	.814
24	3	5-29	5-1	---	.21	1.58	4.13	4.02	.814
		AVERAGE		.6	..3	2.1	4.0	3.9	.814
30	1	6-08	5-2	6.4	7.7	53.5	3.8	3.6	.821

* Engine 5-00 - 1973 Conf. (same as 1972 except retarded 2.50)
Engine 5-0 - Standard 1972 Configuration
Engine 5-OX - 1972 Conf. with 1975 prototype carburetor
Engine 5-1 - 5-OX Conf. with EGR, Air Injection & Catalyst
Engine 5-2 - Same as 5-1 less Catalyst

TABLE E-1 (Cont'd). COMPOSITE EMISSIONS FOR ENGINE 5

NINE-MODE EPA

				HC		CO	NO$_2$		
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	BSFC
28	1	6-07	5-0	6.83	9.45	110	8.22	8.35	.715
28	2	6-07	5-0	6.41	9.09	130	7.24	6.79	.715
28	3	6-07	5-0	6.48	9.72	118	7.67	7.26	.715
		AVERAGE		6.6	9.4	119	7.7	7.5	.715
25	2	5-31	5-1	.61	.24	3.78	4.86	4.73	.718
25	3	5-31	5-1	.68	.28	5.67	4.38	4.00	.718
25	4	5-31	5-1	.65	.30	7.46	4.59	4.45	.718
		AVERAGE		.6	.3	5.6	4.6	4.4	.718

23-MODE EPA

				HC		CO	NO$_2$		
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	BSFC
27	1	6-06	5-0	----	7.80	71.7	----	10.49	.667
27	2	6-06	5-0	----	7.66	86.1	----	8.85	.673
27	3	6-06	5-0	----	7.46	76.3	----	9.87	.676
		AVERAGE			7.6	78		9.7	.67
19	1	5-17	5-OX	----	8.07	91.1	----	8.48	.686
19	2	5-17	5-OX	----	7.61	92.3	----	8.18	.689
19	3	5-17	5-OX	----	7.58	95.4	----	8.04	.685
		AVERAGE			7.7	93		8.2	.69
20	1	5-18	5-1	----	.36	34.5	----	4.34	.719
20	2	5-18	5-1	----	.31	33.3	----	5.22	.716
20	3	5-18	5-1	----	.31	31.5	----	5.25	.716
		AVERAGE			.3	33		4.9	.72

* Engine 5-00 - 1973 Conf. (same as 1972 except retarded 2.50)
Engine 5-0 - Standard 1972 Configuration
Engine 5-OX - 1972 Conf. with 1975 prototype carburetor
Engine 5-1 - 5-OX Conf. with EGR, Air Injection & Catalyst
Engine 5-2 - Same as 5-1 less Catalyst

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                   TABLE E-2. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 5-00  TEST 38  RUN-1   1973 STANDARD (2.5)   06-22-73      K =1.039      HUM = 88.6  GR/LB
----------------------------------------------------------------------------------------------------------------------
           CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE        HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2   FACT.    HC        CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE      122   3.620   9.06    165   12.812   2087      21    1191      9   .232     5.0      276    2.1    0    19.0
2 16 MG     107   1.160  13.08   1280   14.356   8392      68    1370    248   .077     5.2      105   19.1   24    16.0
3 10 MG     113   2.030  13.04   1476   15.192  13109     105    3538    423   .147    15.5      520   62.2   50    10.0
4 16 MG     102   1.490  13.12   1304   14.720   8392      63    1716    247   .077     4.8      132   19.0   24    16.0
5 19 MG      74   1.260  13.26    633   14.605   6169      36    1075     89   .057     2.1       61    5.1   11    19.0
6 16 MG     100   1.320  13.17   1388   14.598   8392      62    1533    268   .077     4.8      118   20.6   24    16.0
7  3 MG     125   4.930  11.91    719   16.975  20548     163   13277    289   .113    18.5     1500   32.7   77     3.0
8 16 MG     102   1.520  13.21   1391   14.840   8392      62    1736    261   .077     4.8      134   20.1   24    16.0
9 C.T.     3250   2.180   5.62    215   11.310   2132     662     830     13   .143    94.6      119    1.9    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.4      122    7.5
1 IDLE      122   3.620   9.06    165   12.812   2087      21    1191      9   .232     5.0      276    2.1    0    19.0
2 16 MG     115   1.370  13.14   1344   14.634   8392      71    1587    256   .077     5.5      122   19.7   24    16.0
3 10 MG     113   2.050  13.06   1504   15.232  13109     105    3564    430   .147    15.4      524   63.2   50    10.0
4 16 MG     109   1.420  13.17   1473   14.708   8392      64    1637    279   .077     4.9      126   21.5   24    16.0
5 19 MG      66   1.490  13.24    666   14.823   6169      39    1253     91   .057     2.2       71    5.2   11    19.0
6 16 MG     105   1.670  13.09   1934   14.873   8392      64    1903    269   .077     4.9      147   20.7   24    16.0
7  3 MG     126   5.250  11.50    789   16.886  20548     166   12905    317   .113    18.7     1458   35.8   77     3.0
8 16 MG     107   1.490  13.30   1448   14.906   8392      65    1695    271   .077     5.0      130   20.8   24    16.0
9 C.T.     3174   2.130   5.86    228   11.423   2132     641     803     14   .143    91.6      115    2.0    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.3      123    7.9
1 IDLE      122   3.000   9.76    245   12.892   2087      21     981     13   .232     4.9      228    3.1    0    19.0
2 16 MG     113   1.420  13.08   1347   14.622   8392      70    1646    266   .077     5.4      127   20.5   24    16.0
3 10 MG     113   2.160  12.99   1554   15.272  13109     105    3745    443   .147    15.4      551   65.1   50    10.0
4 16 MG     107   1.520  13.15   1422   14.786   8392      66    1743    268   .077     5.1      134   20.6   24    16.0
5 19 MG      87   1.550  13.15    668   14.794   6169      39    1306     92   .057     2.2       74    5.3   11    19.0
6 16 MG     107   1.520  13.13   1951   14.766   8392      66    1745    274   .077     5.1      134   21.1   24    16.0
7  3 MG     129   5.400  11.44    705   16.979  20548     169   13201    283   .113    19.1     1492   32.0   77     3.0
8 16 MG     105   1.600  13.21   1450   14.923   8392      64    1817    271   .077     4.9      140   20.8   24    16.0
9 C.T.     3377   2.200   5.49    237   11.337   2132     686     836     15   .143    98.1      120    2.1    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.6      124    7.9
1 IDLE      122   3.000   9.76    245   12.892   2087      21     981     13   .232     4.9      228    3.1    0    19.0
2 16 MG     114   1.470  13.04   1408   14.634   8392      74    1702    268   .077     5.7      131   20.6   24    16.0
3 10 MG     111   2.020  13.00   1633   15.140  13109     104    3533    469   .147    15.3      519   69.0   50    10.0
4 16 MG     106   1.550  13.11   1426   14.774   8392      65    1778    269   .077     5.0      137   20.7   24    16.0
5 19 MG      88   1.640  13.03    641   14.765   6169      40    1384     96   .057     2.3       79    5.5   11    19.0
6 16 MG     109   1.660  13.08   1902   14.858   8392      66    1894    263   .077     5.1      146   20.2   24    16.0
7  3 MG     123   5.530  11.38    731   17.093  20548     160   13468    293   .113    18.1     1522   33.1   77     3.0
8 16 MG     107   1.640  13.12   1444   14.876   8392      65    1869    270   .077     5.0      144   20.8   24    16.0
9 C.T.     3131   2.050   6.03    244   11.961   2132     629     770     15   .143    89.9      110    2.2    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.2      124    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     6.4      123    7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     6.4      124    8.0
FOUR CYCLE COMPOSITE =                HC- NDIR 0.35(     6.4) + 0.65(     6.4) =     6.408   GM/BHP HR
                                      CO- NDIR 0.35(   122.5) + 0.65(   124.1) =   123.579   GM/BHP HR
                                      NO2-NDIR 0.35(     7.7) + 0.65(     8.0) =     7.873   GM/BHP HR
                                                           CORRECTED NO2 =     8.182   GM/BHP HR
                                                                    BSFC =      .726   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE       HC-FID   CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID      CO  NO2-CL  HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE     2765   3.620   9.06     50   12.957   2087      45    1178      3   .232    10.3      273     .6    0    19.0
2 16 MG    2150   1.160  13.08   1075   14.455   8392     125    1360    207   .077     9.6      105   16.0   24    16.0
3 10 MG    2393   2.030  13.04   1212   15.309  13109     205    3511    345   .147    30.1      516   50.6   50    10.0
4 16 MG    2157   1.490  13.12   1100   14.826   8392     122    1704    207   .077     9.4      131   15.9   24    16.0
5 19 MG    1815   1.260  13.26    475   14.701   6169      76    1068     66   .057     4.3       61    3.8   11    19.0
6 16 MG    2381   1.320  13.17   1175   14.728   8392     136    1519    222   .077    10.4      117   17.1   24    16.0
7  3 MG    3005   4.930  11.91    537   17.191  20548     360   13149    214   .113    40.7     1486   24.2   77     3.0
8 16 MG    2159   1.520  13.21   1175   14.946   8392     121    1729    219   .077     9.3      133   16.9   24    16.0
9 C.T.    36953   2.180   5.62     61   11.445   2132     679     820      4   .143    97.1      117     .6    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     9.1      121    6.0
1 IDLE     2765   3.620   9.06     50   12.957   2087      45    1178      3   .232    10.3      273     .6    0    19.0
2 16 MG    2807   1.370  13.14   1100   14.791   8392     159    1570    207   .077    12.3      121   16.0   24    16.0
3 10 MG    2798   2.050  13.06   1350   15.389  13109     238    3527    382   .147    35.0      519   56.1   50    10.0
4 16 MG    2497   1.420  13.17   1250   14.840   8392     141    1622    235   .077    10.9      125   18.1   24    16.0
5 19 MG    2273   1.490  13.24    450   14.957   6169      94    1241     62   .057     5.3       71    3.5   11    19.0
6 16 MG    2600   1.670  13.09   1225   15.010   8392     140    1886    227   .077    10.8      145   17.5   24    16.0
7  3 MG    3032   5.250  11.50    575   17.053  20548     365   12770    230   .113    41.3     1444   26.0   77     3.0
8 16 MG    2529   1.490  13.30   1200   15.093   8392     141    1679    222   .077    10.9      129   17.1   24    16.0
9 C.T.    37802   2.130   5.86     64   11.770   2132     685     779      4   .143    97.9      111     .6    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     9.7      121    6.4
1 IDLE     4047   3.000   9.76     56   13.065   2087      49     966      3   .232    11.3      225     .7    0    19.0
2 16 MG    2750   1.420  13.08   1162   14.775   8392     156    1629    219   .077    12.0      125   16.9   24    16.0
3 10 MG    2879   2.160  12.99   1288   15.438  13109     244    3705    363   .147    35.9      545   53.4   50    10.0
4 16 MG    2640   1.520  13.15   1175   14.934   8392     148    1725    219   .077    11.4      133   16.9   24    16.0
5 19 MG    2329   1.550  13.15    475   14.933   6169      96    1293     66   .057     5.5       74    3.7   11    19.0
6 16 MG    2640   1.520  13.13   1200   14.919   8392     149    1728    224   .077    11.4      133   17.3   24    16.0
7  3 MG    3121   5.460  11.44    475   17.158  20548     374   13068    189   .113    42.2     1477   21.3   77     3.0
8 16 MG    2558   1.600  13.21   1212   15.066   8392     142    1800    224   .077    11.0      139   17.3   24    16.0
9 C.T.    43702   2.200   5.49     63   12.060   2132     773     786      4   .143   110.5      112     .5    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    10.4      122    6.1
1 IDLE     4047   3.000   9.76     56   13.065   2087      49     968      3   .232    11.3      225     .7    0    19.0
2 16 MG    2892   1.470  13.04   1150   14.744   8392     164    1689    217   .077    12.6      130   16.7   24    16.0
3 10 MG    2847   2.020  13.00   1400   15.305  13109     244    3495    398   .147    35.9      514   58.5   50    10.0
4 16 MG    2640   1.550  13.11   1200   14.924   8392     148    1761    224   .077    11.4      136   17.3   24    16.0
5 19 MG    2300   1.640  13.03    487   14.900   6169      95    1372     67   .057     5.4       78    3.8   11    19.0
6 16 MG    2670   1.660  13.08   1162   15.007   8392     149    1875    216   .077    11.5      144   16.6   24    16.0
7  3 MG    3065   5.530  11.38    500   17.216  20548     366   13332    198   .113    41.3     1507   22.4   77     3.0
8 16 MG    2586   1.640  13.12   1175   15.019   8392     144    1851    214   .077    11.1      143   16.5   24    16.0
9 C.T.    41270   2.050   6.03     56   12.207   2132     721     723      3   .143   103.1      103     .5    0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    10.1      123    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     9.4      121    6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    10.2      123    6.2
FOUR CYCLE COMPOSITE =                HC- FID  0.35(     9.4) + 0.65(    10.2) =     9.935   GM/BHP HR
                                      CO- NDIR 0.35(   121.3) + 0.65(   122.6) =   122.161   GM/BHP HR
                                      NO2-CL   0.35(     6.2) + 0.65(     6.2) =     6.215   GM/BHP HR
                                                           CORRECTED NO2 =     6.458   GM/BHP HR
                                                                    BSFC =      .726   LB/BHP HR
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TABLE E-3. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 5-00 TEST 38 RUN-2 1973 STANDARD (2.5) 06-22-73 K =1.039 HUM = 88.6 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	122	3.320	9.02	148	12.478	2087	22	1122	8	.232	5.1	260	1.9	0	19.0
2 16 MG	103	.870	12.72	1115	13.701	8392	68	1076	227	.077	5.2	83	17.5	24	16.0
3 10 MG	110	1.790	12.79	1427	14.699	13109	106	3225	423	.147	15.6	474	62.1	50	10.0
4 16 MG	95	1.090	12.86	1276	14.003	8392	61	1259	254	.077	4.7	97	19.5	24	16.0
5 19 MG	75	1.090	12.86	570	14.031	6169	36	968	83	.057	2.0	55	4.7	11	19.0
6 16 MG	95	1.100	12.86	1332	14.063	8392	61	1326	264	.077	4.7	102	20.3	24	16.0
7 3 MG	122	4.920	11.28	735	16.332	20548	166	12504	307	.113	18.7	1413	34.7	77	3.0
8 16 MG	100	1.190	12.86	1276	14.160	8392	64	1425	251	.077	4.9	110	19.3	24	16.0
9 C.T.	3252	1.860	5.36	215	10.738	2132	698	746	14	.143	99.8	107	2.0	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											6.6	111	7.5		
1 IDLE	122	3.320	9.02	148	12.478	2087	22	1122	8	.232	5.1	260	1.9	0	19.0
2 16 MG	112	1.090	12.79	1240	14.001	8392	73	1320	247	.077	5.6	102	19.0	24	16.0
3 10 MG	112	1.790	12.79	1524	14.701	13109	108	3224	451	.147	15.9	474	66.3	50	10.0
4 16 MG	103	1.220	12.86	1332	14.191	8392	66	1457	262	.077	5.1	112	20.1	24	16.0
5 19 MG	89	1.150	12.86	614	14.101	6169	40	1016	89	.057	2.3	58	5.1	11	19.0
6 16 MG	103	.970	12.86	1389	13.991	8392	67	1179	278	.077	5.2	91	21.4	24	16.0
7 3 MG	122	4.980	11.28	736	16.392	20548	165	12610	306	.113	18.7	1425	34.6	77	3.0
8 16 MG	103	1.310	12.86	1351	14.281	8392	65	1555	264	.077	5.0	120	20.3	24	16.0
9 C.T.	3347	2.090	5.36	224	11.065	2132	697	813	14	.143	99.6	116	2.0	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											6.7	114	7.9		
1 IDLE	122	2.830	9.44	225	12.402	2087	22	962	13	.232	5.1	223	2.9	0	19.0
2 16 MG	112	1.020	12.79	1351	13.931	8392	73	1241	270	.077	5.6	96	20.8	24	16.0
3 10 MG	112	1.790	12.79	1564	14.701	13109	108	3224	463	.147	15.9	474	68.1	50	10.0
4 16 MG	103	1.110	12.86	1351	14.081	8392	66	1336	267	.077	5.1	103	20.6	24	16.0
5 19 MG	89	1.290	12.86	619	14.241	6169	39	1129	88	.057	2.2	64	5.0	11	19.0
6 16 MG	103	1.070	12.86	1446	14.041	8392	66	1292	287	.077	5.1	99	22.1	24	16.0
7 3 MG	127	4.980	11.28	767	16.397	20548	172	12606	319	.113	19.4	1424	36.1	77	3.0
8 16 MG	103	1.190	12.86	1370	14.161	8392	66	1425	270	.077	5.1	110	20.8	24	16.0
9 C.T.	3205	2.020	5.51	251	10.991	2132	671	791	16	.143	96.0	113	2.3	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											6.6	112	8.2		
1 IDLE	122	2.830	9.44	225	12.402	2087	22	962	13	.232	5.1	223	2.9	0	19.0
2 16 MG	117	1.090	12.72	1351	13.936	8392	76	1326	270	.077	5.9	102	20.8	24	16.0
3 10 MG	112	1.860	12.72	1564	14.701	13109	108	3350	463	.147	15.9	492	68.1	50	10.0
4 16 MG	103	1.220	12.86	1408	14.191	8392	66	1457	276	.077	5.1	112	21.3	24	16.0
5 19 MG	89	1.150	12.86	659	14.101	6169	40	1016	96	.057	2.3	58	5.5	11	19.0
6 16 MG	103	1.160	12.86	1446	14.131	8392	66	1392	285	.077	5.1	107	22.0	24	16.0
7 3 MG	124	4.750	11.35	846	16.234	20548	170	12145	356	.113	19.2	1372	40.2	77	3.0
8 16 MG	103	1.240	12.86	1446	14.261	8392	65	1533	282	.077	5.0	118	21.8	24	16.0
9 C.T.	3069	2.040	5.36	253	10.759	2132	656	837	17	.143	93.8	120	2.4	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											6.5	112	8.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---											6.7	113	7.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---											6.5	112	8.3		

FOUR CYCLE COMPOSITE -

HC- NDIR 0.35(6.7) + 0.65(6.5) = 6.585 GM/BHP HR
CO- NDIR 0.35(112.7) + 0.65(111.7) = 112.045 GM/BHP HR
NO2-NDIR 0.35(7.7) + 0.65(8.3) = 8.106 GM/BHP HR
CORRECTED NO2 = 8.424 GM/BHP HR
BSFC = .726 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	3092	3.320	9.02	50	12.649	2087	51	1106	3	.232	11.8	257	.6	0	19.0
2 16 MG	2561	.870	12.72	950	13.846	8392	155	1065	191	.077	12.0	82	14.7	24	16.0
3 10 MG	2724	1.790	12.79	1212	14.852	13109	240	3191	355	.147	35.3	469	52.2	50	10.0
4 16 MG	2370	1.040	12.86	1100	14.137	8392	141	1247	217	.077	10.8	96	16.7	24	16.0
5 19 MG	1476	1.090	12.86	437	14.098	6169	86	960	63	.057	4.9	55	3.6	11	19.0
6 16 MG	2415	1.100	12.86	1112	14.201	8392	137	1319	218	.077	10.5	101	16.8	24	16.0
7 3 MG	2990	4.920	11.28	570	16.499	20548	372	12377	236	.113	42.1	1399	26.6	77	3.0
8 16 MG	2401	1.190	12.86	1100	14.290	8392	141	1412	214	.077	10.9	109	16.5	24	16.0
9 C.T.	37551	1.860	5.36	67	10.975	2132	729	730	4	.143	104.3	104	.6	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											10.0	110	6.1		
1 IDLE	3092	3.320	9.02	50	12.649	2087	51	1106	3	.232	11.8	257	.6	0	19.0
2 16 MG	2821	1.090	12.79	1075	14.162	8392	167	1305	211	.077	12.9	100	16.3	24	16.0
3 10 MG	2951	1.790	12.79	1325	14.875	13109	260	3187	388	.147	38.2	468	57.0	50	10.0
4 16 MG	2656	1.220	12.86	1150	14.346	8392	155	1442	223	.077	12.0	111	17.2	24	16.0
5 19 MG	2231	1.150	12.86	480	14.233	6169	97	1007	69	.057	5.5	57	3.9	11	19.0
6 16 MG	2594	.970	12.86	1225	14.089	8392	155	1167	242	.077	11.9	90	18.7	24	16.0
7 3 MG	3221	4.980	11.28	575	16.582	20548	399	12466	237	.113	45.1	1409	26.7	77	3.0
8 16 MG	2545	1.310	12.86	1187	14.424	8392	148	1540	229	.077	11.4	119	17.7	24	16.0
9 C.T.	43612	2.090	5.36	75	11.811	2132	787	762	4	.143	112.6	109	.6	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											10.8	112	6.6		
1 IDLE	3173	2.830	9.44	62	12.587	2087	53	948	3	.232	12.2	220	.8	0	19.0
2 16 MG	2763	1.020	12.79	1175	14.086	8392	165	1227	232	.077	12.7	95	17.9	24	16.0
3 10 MG	2899	1.790	12.79	1362	14.869	13109	255	3188	399	.147	37.5	469	58.6	50	10.0
4 16 MG	2597	1.110	12.86	1178	14.230	8392	153	1322	230	.077	11.8	102	17.7	24	16.0
5 19 MG	2262	1.290	12.86	460	14.376	6169	97	1118	64	.057	5.5	64	3.7	11	19.0
6 16 MG	2596	1.070	12.86	1280	14.190	8392	154	1278	245	.077	11.8	98	18.9	24	16.0
7 3 MG	3187	4.980	11.28	587	16.579	20548	395	12468	242	.113	44.6	1409	27.3	77	3.0
8 16 MG	2554	1.190	12.86	1112	14.305	8392	150	1410	217	.077	11.5	109	16.7	24	16.0
9 C.T.	44925	2.020	5.51	78	12.023	2132	797	724	5	.143	113.9	103	.7	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											10.8	110	6.7		
1 IDLE	3173	2.830	9.44	62	12.587	2087	53	948	3	.232	12.2	220	.8	0	19.0
2 16 MG	2932	1.090	12.72	1163	14.103	8392	174	1310	230	.077	13.4	101	17.7	24	16.0
3 10 MG	2951	1.860	12.72	1287	14.875	13109	260	3311	377	.147	38.2	487	55.4	50	10.0
4 16 MG	2656	1.220	12.86	1175	14.346	8392	155	1442	228	.077	12.0	111	17.6	24	16.0
5 19 MG	2316	1.150	12.86	487	14.242	6169	100	1006	70	.057	5.7	57	4.0	11	19.0
6 16 MG	2596	1.160	12.86	1250	14.280	8392	153	1377	244	.077	11.8	106	18.8	24	16.0
7 3 MG	3160	4.750	11.35	650	16.416	20548	395	12010	270	.113	44.7	1357	30.5	77	3.0
8 16 MG	2544	1.240	12.86	1237	14.354	8392	148	1518	239	.077	11.4	117	18.4	24	16.0
9 C.T.	41901	2.040	5.36	63	11.590	2132	767	773	4	.143	109.7	111	.6	0	24.2
---CYCLE COMPOSITE IN GM/BHP HR---											10.7	110	6.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---											10.4	111	6.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---											10.7	110	6.7		

FOUR CYCLE COMPOSITE -

HC- FID 0.35(10.4) + 0.65(10.7) = 10.628 GM/BHP HR
CO- NDIR 0.35(111.3) + 0.65(110.1) = 110.519 GM/BHP HR
NO2-CL 0.35(6.3) + 0.65(6.7) = 6.591 GM/BHP HR
CORRECTED NO2 = 6.849 GM/BHP HR
BSFC = .726 LB/BHP HR

                TABLE E-4. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 5-08  TEST-38  RUN-3   1973 STANDARD (2.5)   06-22-73       K =1.058     HUM = 96.9  GR/LB
----------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE           HC     CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC      CO    NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        117   3.050   9.17    122   12.346    2087      21    1041      7    .232     5.0    242    1.6     0    19.0
2 16 MG       102    .950  12.72   1167   13.780    8392      67    1169    236    .077     5.2     90   18.2    24    16.0
3 10 MG       112   1.720  12.86   1426   14.701   13109     108    3098    422    .147    15.9    455   62.1    50    10.0
4 16 MG        98   1.030  12.86   1276   13.996    8392      63    1248    254    .077     4.9     96   19.6    24    16.0
5 19 MG        74    .970  12.86    511   13.910    6169      35     869     75    .057     2.0     50    4.3    11    19.0
6 16 MG        93   1.000  12.86   1350   13.960    8392      60    1214    269    .077     4.6     93   20.7    24    16.0
7  3 MG       121   4.860  11.28    689   16.271   20598     165   12398    289    .113    18.6   1401   32.6    77     3.0
8 16 MG        93   1.010  13.00   1313   14.110    8392      60    1213    259    .077     4.6     93   20.0    24    16.0
9 C.T.       3252   2.250   5.51    147   11.272    2132     669     860      9    .143    95.6    123    1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.5    110    7.6
1 IDLE        117   3.050   9.17    122   12.346    2087      21    1041      7    .232     5.0    242    1.6     0    19.0
2 16 MG       112   1.000  12.72   1258   13.841    8392      73    1225    253    .077     5.6     94   19.5    24    16.0
3 10 MG       112   1.590  12.86   1504   14.571   13109     109    2888    449    .147    16.0    424   66.0    50    10.0
4 16 MG       102   1.030  12.86   1350   14.000    8392      66    1247    269    .077     5.1     96   20.7    24    16.0
5 19 MG        74    .980  12.86    569   13.920    6169      35     877     84    .057     2.0     50    4.8    11    19.0
6 16 MG       102   1.070  12.86   1369   14.040    8392      66    1292    272    .077     5.1     99   20.9    24    16.0
7  3 MG       126   5.030  11.28    659   16.446   20598     170   12696    274    .113    19.2   1435   30.9    77     3.0
8 16 MG       102   1.150  12.86   1331   14.120    8392      66    1381    263    .077     5.0    106   20.2    24    16.0
9 C.T.       3063   2.090   5.66    145   11.058    2132     638     814      9    .143    91.2    116    1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.4    110    7.7
1 IDLE        112   2.750   9.55    122   12.421    2087      20     933      7    .232     4.7    217    1.6     0    19.0
2 16 MG       115   1.130  12.72   1313   13.974    8392      74    1371    262    .077     5.7    106   20.2    24    16.0
3 10 MG       112   1.830  12.72   1504   14.671   13109     108    3303    446    .147    15.9    486   65.6    50    10.0
4 16 MG       102   1.190  12.86   1294   14.160    8392      65    1425    255    .077     5.0    110   19.6    24    16.0
5 19 MG        82   1.020  12.86    584   13.969    6169      39     910     86    .057     2.2     52    4.9    11    19.0
6 16 MG        98   1.040  12.86   1369   14.006    8392      63    1259    272    .077     4.9     97   21.0    24    16.0
7  3 MG       121   4.580  11.53    798   16.241   20598     165   11705    335    .113    18.7   1323   37.9    77     3.0
8 16 MG        98   1.150  12.86   1313   14.116    8392      63    1381    259    .077     4.8    106   20.0    24    16.0
9 C.T.       2830   2.020   5.81    140   10.886    2132     599     799      9    .143    85.6    114    1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.1    108    8.0
1 IDLE        112   2.750   9.55    122   12.421    2087      20     933      7    .232     4.7    217    1.6     0    19.0
2 16 MG       112   1.020  12.86   1276   14.001    8392      73    1235    254    .077     5.6     95   19.6    24    16.0
3 10 MG       112   1.750  12.86   1504   14.731   13109     108    3146    444    .147    15.8    462   65.3    50    10.0
4 16 MG        98   1.150  12.86   1350   14.116    8392      63    1381    266    .077     4.8    106   20.5    24    16.0
5 19 MG        79   1.110  12.86    614   14.055    6169      37     984     89    .057     2.1     56    5.1    11    19.0
6 16 MG       102   1.150  12.86   1369   14.120    8392      65    1381    270    .077     5.0    106   20.8    24    16.0
7  3 MG       121   4.690  11.41    798   16.231   20598     165   11994    335    .113    18.7   1355   37.9    77     3.0
8 16 MG        98   1.130  12.86   1276   14.096    8392      63    1359    252    .077     4.9    105   19.4    24    16.0
9 C.T.       2923   1.940   5.97    143   11.067    2132     608     755      9    .143    87.0    108    1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.2    108    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     6.4    110    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     6.1    108    7.9
FOUR CYCLE COMPOSITE -
                                   HC- NDIR 0.35(     6.4) + 0.65(     6.1) =    6.238   GM/BHP HR
                                   CO- NDIR 0.35(   110.0) + 0.65(   108.2) =  108.789   GM/BHP HR
                                   NO2-NDIR 0.35(     7.6) + 0.65(     7.9) =    7.820   GM/BHP HR
                                                          CORRECTED NO2 =    8.275   GM/BHP HR
                                                                   BSFC =     .729   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE         HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP     VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE       3228   3.050   9.17     50   12.543    2087      54    1025      3    .232    12.5    238     .6     0    19.0
2 16 MG      2647    .950  12.72   1017   13.935    8392     159    1156    203    .077    12.3     89   15.7    24    16.0
3 10 MG      2610   1.720  12.86   1275   14.841   13109     231    3069    374    .147    33.9    451   55.0    50    10.0
4 16 MG      2313   1.030  12.86   1150   14.121    8392     137    1236    227    .077    10.6     95   17.5    24    16.0
5 19 MG      1833    .970  12.86    430   14.013    6169      81     863     63    .057     4.6     49    3.6    11    19.0
6 16 MG      2144   1.000  12.86   1187   14.074    8392     128    1204    235    .077     9.8     93   18.1    24    16.0
7  3 MG      2856   4.860  11.28    575   16.426   20598     357   12281    239    .113    40.4   1388   27.0    77     3.0
8 16 MG      2174   1.010  13.00   1187   14.227    8392     128    1203    232    .077     9.9     93   17.9    24    16.0
9 C.T.      37727   2.250   5.51     62   11.533    2132     697     840      4    .143    99.7    120     .5     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.7    108    6.5
1 IDLE       3228   3.050   9.17     50   12.543    2087      54    1025      3    .232    12.5    238     .6     0    19.0
2 16 MG      2282   1.000  12.72   1125   13.948    8392     137    1215    225    .077    10.6     94   17.3    24    16.0
3 10 MG      2466   1.590  12.86   1350   14.697   13109     220    2865    400    .147    32.3    421   58.8    50    10.0
4 16 MG      2201   1.030  12.86   1250   14.110    8392     131    1237    247    .077    10.1     95   19.0    24    16.0
5 19 MG      1748    .980  12.86    475   14.015    6169      77     871     69    .057     4.4     50    4.0    11    19.0
6 16 MG      2201   1.070  12.86   1225   14.150    8392     131    1282    241    .077    10.1     99   18.6    24    16.0
7  3 MG      2762   5.030  11.28    550   16.586   20598     342   12588    226    .113    38.7   1422   25.6    77     3.0
8 16 MG      2191   1.150  12.86   1200   14.229    8392     129    1370    235    .077    10.0    105   18.1    24    16.0
9 C.T.      33865   2.090   5.66     70   11.137    2132     648     808      4    .143    92.7    116     .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.2    109    6.7
1 IDLE       2840   2.750   9.55     63   12.584    2087      47     921      3    .232    10.9    214     .8     0    19.0
2 16 MG      2454   1.130  12.72   1125   14.095    8392     146    1359    222    .077    11.2    105   17.1    24    16.0
3 10 MG      2751   1.830  12.72   1376   14.825   13109     243    3264    404    .147    35.8    480   59.3    50    10.0
4 16 MG      2458   1.190  12.86   1175   14.296    8392     144    1411    229    .077    11.1    109   17.6    24    16.0
5 19 MG      2054   1.020  12.86    500   14.086    6169      90     902     73    .057     5.1     51    4.1    11    19.0
6 16 MG      2314   1.040  12.86   1262   14.131    8392     137    1248    249    .077    10.6     96   19.2    24    16.0
7  3 MG      3016   4.580  11.53    700   16.412   20598     378   11583    291    .113    42.7   1309   32.9    77     3.0
8 16 MG      2316   1.150  12.86   1212   14.242    8392     136    1369    237    .077    10.5    105   18.3    24    16.0
9 C.T.      33460   2.020   5.81     76   11.176    2132     638     778      5    .143    91.3    111     .7     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.5    107    7.0
1 IDLE       2840   2.750   9.55     63   12.584    2087      47     921      3    .232    10.9    214     .8     0    19.0
2 16 MG      2624   1.020  12.86   1162   14.142    8392     156    1223    229    .077    12.0     94   17.6    24    16.0
3 10 MG      2809   1.750  12.86   1400   14.891   13109     247    3112    409    .147    36.4    457   60.1    50    10.0
4 16 MG      2485   1.150  12.86   1225   14.259    8392     146    1367    239    .077    11.3    105   18.4    24    16.0
5 19 MG      2061   1.110  12.86    525   14.176    6169      90     976     76    .057     5.1     56    4.3    11    19.0
6 16 MG      2429   1.150  12.86   1275   14.253    8392     143    1368    249    .077    11.0    105   19.2    24    16.0
7  3 MG      3045   4.690  11.41    687   16.404   20598     381   11867    286    .113    43.1   1341   32.3    77     3.0
8 16 MG      2344   1.130  12.86   1187   14.224    8392     138    1347    232    .077    10.6    104   17.9    24    16.0
9 C.T.      39493   1.940   5.97     68   11.859    2132     710     705      4    .143   101.5    101     .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------    10.0    107    7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     9.4    109    6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     9.8    107    7.1
FOUR CYCLE COMPOSITE -
                                   HC- FID  0.35(     9.4) + 0.65(     9.8) =    9.644   GM/BHP HR
                                   CO- NDIR 0.35(   108.9) + 0.65(   106.9) =  107.572   GM/BHP HR
                                   NO2-CL   0.35(     6.6) + 0.65(     7.1) =    6.906   GM/BHP HR
                                                          CORRECTED NO2 =    7.307   GM/BHP HR
                                                                   BSFC =     .729   LB/BHP HR
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                          TABLE E-5. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 5-U   TEST 32 RUN 1    1972 STANDARD (5)     06-22-73     K =1.029     HUM = 84.9  GR/LB
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            CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR             MAN.
MODE        HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2  FACT.   HC       CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------
1 IDLE      141   3.870   9.54    122  13.562   2132      24    1229      6  .232     5.6     285    1.5    0   -0.0
2 16 MG     115    .780  13.04   1589  13.944   8482      76     958    321  .077     5.8      74   24.7   25   -0.0
3 10 MG     115   1.390  13.41   1980  14.874  13200     110    2402    583  .147    16.2     353   85.8   51   -0.0
4 16 MG      99    .850  13.26   1668  14.217   8482      64    1024    330  .077     4.9      79   25.4   25   -0.0
5 19 MG      75    .730  13.34    730  14.151   6305      36     657    108  .057     2.1      37    6.2   11   -0.0
6 16 MG      96    .810  13.27   1686  14.184   8482      62     978    335  .077     4.8      75   25.8   25   -0.0
7  3 MG     127   4.360  12.02   1057  16.517  20684     172   11029    939  .113    19.4    1246   99.7   79   -0.0
8 16 MG      99   1.000  13.33   1767  14.437   8482      63    1187    343  .077     4.8      91   26.4   25   -0.0
9 C.T.     3009   2.980   4.99    126  10.720   2223     674    1039      9  .143    96.4     149    1.2    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     6.4      96    9.9
1 IDLE      141   3.380   9.54    122  13.072   2132      25    1114      7  .232     5.8     258    1.5    0   -0.0
2 16 MG     109    .950  13.08   1632  14.148   8482      71    1151    325  .077     5.4      89   25.0   25   -0.0
3 10 MG     109   1.570  13.27   1990  14.958  13200     104    2799    583  .147    15.3     411   85.7   51   -0.0
4 16 MG      95    .880  13.31   1774  14.293   8482      61    1055    350  .077     4.7      81   26.9   25   -0.0
5 19 MG      74    .880  13.37    741  14.330   6305      35     782    116  .057     2.0      45    6.6   11   -0.0
6 16 MG      95   1.000  13.27   1784  14.373   8482      61    1192    345  .077     4.7      92   26.5   25   -0.0
7  3 MG     125   4.510  11.97   1021  16.615  20684     168   11341    922  .113    19.0    1282   97.7   79   -0.0
8 16 MG      97   1.230  13.26   1733  14.595   8482      61    1444    334  .077     4.7     111   25.7   25   -0.0
9 C.T.     3030   2.970   5.07    138  10.812   2223     673    1026      9  .143    96.2     147    1.3    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     6.3     101    9.9
1 IDLE      127   3.440  10.03    153  13.607   2132      21    1089      8  .232     5.0     253    1.8    0   -0.0
2 16 MG     103    .870  13.17   1595  14.151   8482      67    1053    317  .077     5.1      81   24.4   25   -0.0
3 10 MG     110   1.470  13.30   2028  14.884  13200     105    2633    597  .147    15.5     387   87.7   51   -0.0
4 16 MG      92    .850  13.31   1733  14.254   8482      59    1021    342  .077     4.6      79   26.4   25   -0.0
5 19 MG      70    .870  13.30    727  14.246   6305      33     778    107  .057     1.9      44    6.1   11   -0.0
6 16 MG      90    .890  13.29   1712  14.277   8482      58    1068    338  .077     4.4      82   26.0   25   -0.0
7  3 MG     122   4.550  11.90   1008  16.582  20684     164   11466    917  .113    18.6    1296   97.2   79   -0.0
8 16 MG      95   1.150  13.29   1718  14.593   8482      60    1355    333  .077     4.6     104   25.6   25   -0.0
9 C.T.     3112   2.400   5.03    151  10.791   2223     692     999     10  .143    99.0     143    1.5    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     6.3      99    9.9
1 IDLE      127   3.440  10.03    153  13.607   2132      21    1089      8  .232     5.0     253    1.8    0   -0.0
2 16 MG     100    .820  13.14   1661  14.068   8482      65     999    332  .077     5.0      77   25.6   25   -0.0
3 10 MG     103   1.430  13.31   2043  14.851  13200      99    2567    603  .147    14.5     377   88.6   51   -0.0
4 16 MG      88    .860  13.21   1771  14.165   8482      57    1040    352  .077     4.4      80   27.1   25   -0.0
5 19 MG      60    .570  13.42    816  14.055   6305      29     517    122  .057     1.7      29    6.9   11   -0.0
6 16 MG      88    .850  13.23   1767  14.175   8482      57    1027    351  .077     4.4      79   27.0   25   -0.0
7  3 MG     122   4.550  11.89   1027  16.572  20684     164   11472    926  .113    18.6    1296   98.1   79   -0.0
8 16 MG      93   1.060  13.29   1764  14.450   8482      59    1257    344  .077     4.5      97   26.5   25   -0.0
9 C.T.     3107   2.370   5.09    175  10.816   2223     690     984     12  .143    98.6     141    1.7    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     6.3      97   10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------     6.4      98    9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------     6.3      98   10.0
FOUR CYCLE COMPOSITE -
                              HC- NDIR 0.35(    6.4) + 0.65(    6.3) =    6.322   GM/BHP HR
                              CO- NDIR 0.35(   98.1) + 0.65(   97.9) =   97.983   GM/BHP HR
                              NO2-NDIR 0.35(    9.9) + 0.65(   10.0) =    9.955   GM/BHP HR
                                                  CORRECTED NO2 =   10.244   GM/BHP HR
                                                           BSFC =     .711   LB/BHP HR
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR               MAN.
MODE        HC-FID    CO    CO2   NO-CL  CARBON   CONS.     HC      CO     NO2  FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------
1 IDLE     3396   3.870   9.54     45  13.750   2132      53    1212      2  .232    12.2     281     .5    0   -0.0
2 16 MG    2509    .780  13.04   1450  14.071   8482     151     950    290  .077    11.6      73   22.3   25   -0.0
3 10 MG    2642   1.390  13.41   1862  15.014  13200     232    2380    543  .147    34.1     350   79.9   51   -0.0
4 16 MG    2284    .850  13.26   1663  14.334   8482     135    1016    307  .077    10.4      78   23.6   25   -0.0
5 19 MG    1762    .730  13.34    625  14.245   6305      78     653     92  .057     4.4      37    5.2   11   -0.0
6 16 MG    2232    .810  13.27   1580  14.303   8482     132     970    311  .077    10.2      75   24.0   25   -0.0
7  3 MG    2971   4.360  12.02    925  16.677  20684     368   10923    381  .113    41.6    1234   43.0   79   -0.0
8 16 MG    2350   1.000  13.33   1630  14.565   8482     137    1176    315  .077    10.5      91   24.3   25   -0.0
9 C.T.    47090   2.980   4.99     15  12.174   2223     859     915      1  .143   122.8     131     .1    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    10.3      94    8.9
1 IDLE     3382   3.380   9.54     45  13.258   2132      54    1098      2  .232    12.6     255     .6    0   -0.0
2 16 MG    2598    .950  13.08   1475  14.290   8482     154    1139    291  .077    11.9      88   22.4   25   -0.0
3 10 MG    2758   1.570  13.27   1875  15.116  13200     241    2769    544  .147    35.4     407   79.9   51   -0.0
4 16 MG    2376    .880  13.31   1663  14.428   8482     140    1045    325  .077    10.8      80   25.0   25   -0.0
5 19 MG    1952    .880  13.37    713  14.445   6305      85     776    103  .057     4.9      44    5.9   11   -0.0
6 16 MG    2405   1.000  13.27   1650  14.511   8482     141    1181    320  .077    10.8      91   24.7   25   -0.0
7  3 MG    3025   4.510  11.97    900  16.783  20684     373   11228    368  .113    42.1    1269   41.6   79   -0.0
8 16 MG    2410   1.230  13.26   1588  14.731   8482     139    1431    304  .077    10.7     110   23.4   25   -0.0
9 C.T.    46641   2.470   5.07     20  12.204   2223     850     909      1  .143   121.5     130     .2    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    10.4      99    8.9
1 IDLE     3261   3.440  10.03     54  13.796   2132      50    1074      3  .232    11.7     249     .6    0   -0.0
2 16 MG    2542    .870  13.17   1500  14.294   8482     151    1043    296  .077    11.6      80   22.8   25   -0.0
3 10 MG    2484   1.470  13.30   1925  15.018  13200     218    2610    562  .147    32.1     384   82.6   51   -0.0
4 16 MG    2347    .850  13.31   1630  14.395   8482     138    1012    319  .077    10.6      78   24.6   25   -0.0
5 19 MG    1845    .870  13.30    638  14.359   6305      83     772     93  .057     4.7      44    5.3   11   -0.0
6 16 MG    2347    .890  13.29   1625  14.415   8482     138    1058    317  .077    10.6      81   24.4   25   -0.0
7  3 MG    3082   4.550  11.90    875  16.758  20684     380   11344    359  .113    43.0    1282   40.5   79   -0.0
8 16 MG    2517   1.150  13.29   1587  14.692   8482     145    1341    304  .077    11.2     103   23.4   25   -0.0
9 C.T.    47452   2.400   5.03     20  12.175   2223     866     885      1  .143   123.9     127     .2    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    10.4      97    9.0
1 IDLE     3261   3.440  10.03     54  13.796   2132      50    1074      3  .232    11.7     249     .6    0   -0.0
2 16 MG    2428    .820  13.14   1538  14.203   8482     145     984    305  .077    11.2      76   23.5   25   -0.0
3 10 MG    2642   1.430  13.31   1950  15.004  13200     232    2541    570  .147    34.2     374   83.7   51   -0.0
4 16 MG    2232    .860  13.21   1663  14.243   8482     132    1031    328  .077    10.2      79   25.2   25   -0.0
5 19 MG    1638    .570  13.42    788  14.154   6305      73     513    117  .057     4.2      29    6.6   11   -0.0
6 16 MG    4544    .850  13.23   1663  14.535   8482     265    1002    322  .077    20.4      77   24.8   25   -0.0
7  3 MG    2995   4.550  11.89    888  16.740  20684     370   11357    364  .113    41.8    1283   41.2   79   -0.0
8 16 MG    2350   1.060  13.29   1650  14.585   8482     137    1245    319  .077    10.5      96   24.5   25   -0.0
9 C.T.    46609   2.370   5.09     20  12.121   2223     855     878      1  .143   122.2     126     .2    0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    10.7      96    9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    10.4      96    8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    10.5      96    9.1
FOUR CYCLE COMPOSITE -
                             HC- FID  0.35(   10.4) + 0.65(   10.5) =   10.465   GM/BHP HR
                             CO- NDIR 0.35(   96.5) + 0.65(   96.3) =   96.369   GM/BHP HR
                             NO2-CL   0.35(    8.9) + 0.65(    9.1) =    9.036   GM/BHP HR
                                                 CORRECTED NO2 =    9.299   GM/BHP HR
                                                          BSFC =     .711   LB/BHP HR
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                      TABLE E-6. MASS EMISSIONS BY NINE-MODE FTP
ENGINE S-D   TEST 32 RUN 2    1972 STANDARD (S)     06-22-73      K =1.086      HUM =110.2  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR           MAN.
MODE         HC      CO     CO2     NO   CARBON   CONS.     HC      CO    NO2   FACT.    HC       CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE       140   3.400   9.39     41   12.991   2132      25    1131      5   .232     5.8     263    1.2     0   -0.0
2 16 MG      141   1.090  12.87   1482   14.062   8482      92    1267    297   .077     7.1      98   22.9    25   -0.0
3 10 MG      124   1.640  13.05   1861   14.724  13200     120    2789    554   .147    17.6     410   81.4    51   -0.0
4 16 MG      108    .980  13.03   1615   14.127   8482      70    1189    322   .077     5.4      92   24.8    25   -0.0
5 19 MG       85   1.090  13.07    630   14.252   6305      41     979     93   .057     2.3      56    5.3    11   -0.0
6 16 MG      105   1.060  13.01   1677   14.183   8482      68    1280    333   .077     5.2      99   25.6    25   -0.0
7  3 MG      135   4.830  11.56    828   16.536  20684     182   12204    344   .113    20.6    1379   38.9    79   -0.0
8 16 MG      107   1.270  13.04   1647   14.426   8482      68    1508    322   .077     5.2     116   24.8    26   -0.0
9 C.T.      3736   2.400   4.81    119   11.295   2223     798     458      8   .143   114.1     137    1.1     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     7.3     106    9.0
1 IDLE       140   3.400   9.39     41   12.991   2132      25    1131      5   .232     5.8     263    1.2     0   -0.0
2 16 MG      123   1.180  12.94   1605   14.253   8482      79    1419    317   .077     6.1     109   24.4    25   -0.0
3 10 MG      124   2.090  12.88   1723   15.054  13200     117    3613    502   .147    17.3     531   73.7    51   -0.0
4 16 MG      112   1.260  13.05   1687   14.431   8482      71    1496    323   .077     5.5     115   24.9    25   -0.0
5 19 MG       92   1.430  12.97    682   14.499   6305      43    1256     98   .057     2.5      72    5.6    11   -0.0
6 16 MG      112   1.310  12.99   1648   14.421   8482      71    1656    322   .077     5.5     128   24.8    25   -0.0
7  3 MG      134   4.480  11.79    961   16.365  20684     183   11438    403   .113    20.7    1293   45.6    79   -0.0
8 16 MG      108   1.290  13.03   1623   14.437   8482      69    1531    317   .077     5.3     118   24.4    26   -0.0
9 C.T.      3814   2.450   4.96    107   11.624   2223     794     954      7   .143   113.6     136    1.0     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     7.3     110    9.0
1 IDLE       139   3.120  10.06     44   13.330   2132      24    1008      5   .232     5.6     234    1.2     0   -0.0
2 16 MG      122   1.290  12.87   1563   14.292   8482      78    1547    308   .077     6.0     119   23.7    25   -0.0
3 10 MG      119   1.770  12.99   1886   14.839  13200     114    3181    557   .147    16.8     468   81.9    51   -0.0
4 16 MG      111   1.360  12.95   1598   14.430   8482      70    1615    312   .077     5.4     124   24.0    25   -0.0
5 19 MG       89   1.240  13.03    682   14.366   6305      42    1099     99   .057     2.4      63    5.7    11   -0.0
6 16 MG      112   1.490  12.91   1592   14.471   8482      71    1708    310   .077     5.5     131   23.9    25   -0.0
7  3 MG      138   5.040  11.43    823   16.619  20684     185   12671    340   .113    21.0    1432   38.4    79   -0.0
8 16 MG      110   1.520  12.99   1620   14.629   8482      69    1780    312   .077     5.3     137   24.0    26   -0.0
9 C.T.      3259   2.340   6.08    256   11.990   2223     655     880     16   .143    93.7     126    2.3     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     6.5     113    9.0
1 IDLE       139   3.120  10.06     44   13.330   2132      24    1008      5   .232     5.6     234    1.2     0   -0.0
2 16 MG      121   1.270  12.90   1561   14.301   8482      78    1522    307   .077     6.0     117   23.7    25   -0.0
3 10 MG      119   1.880  12.87   1814   14.879  13200     114    3369    534   .147    16.8     495   78.5    51   -0.0
4 16 MG      109   1.570  12.90   1597   14.588   8482      68    1844    308   .077     5.3     142   23.7    25   -0.0
5 19 MG      100   1.770  12.88    723   14.758   6305      46    1528    103   .057     2.6      87    5.8    11   -0.0
6 16 MG      119   1.510  12.93   1690   14.563   8482      72    1777    327   .077     5.5     137   25.2    25   -0.0
7  3 MG      137   5.050  11.96    814   16.658  20684     184   12666    336   .113    20.8    1431   37.9    79   -0.0
8 16 MG      108   1.350  13.05   1727   14.617   8482      68    1593    335   .077     5.2     123   25.8    25   -0.0
9 C.T.      3758   2.440   5.10    121   11.599   2223     778     945      8   .143   111.2     135    1.1     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     7.2     116    8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     7.3     108    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     6.8     115    9.0
FOUR CYCLE COMPOSITE =
                                      HC- NDIR 0.35(    7.3) + 0.65(    6.8) =    6.984   GM/BHP HR
                                      CO- NDIR 0.35(  108.1) + 0.65(  114.7) =  112.350   GM/BHP HR
                                      NO2-NDIR 0.35(    9.0) + 0.65(    9.0) =    8.982   GM/BHP HR
                                                         CORRECTED NO2 =    9.746   GM/BHP HR
                                                                  BSFC =     .711   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR           MAN.
MODE        HC-FID    CO     CO2  NO-CL  CARBON   CONS.     HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL  HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE      3148   3.400   9.39     40   13.110   2132      52    1117      2   .232    12.1     259     .5     0   -0.0
2 16 MG     2568   1.090  12.87   1300   14.167   8482     154    1258    258   .077    11.8      97   19.9    25   -0.0
3 10 MG     2667   1.590  13.05   1688   14.887  13200     237    2764    498   .147    34.8     406   73.2    51   -0.0
4 16 MG     2321    .980  13.03   1463   14.292   8482     138    1179    289   .077    10.6      91   22.3    25   -0.0
5 19 MG     1951   1.090  13.07    538   14.355   6305      86     967     78   .057     4.9      55    4.5    11   -0.0
6 16 MG     2232   1.060  13.01   1620   14.293   8482     132    1271    299   .077    10.2      98   23.1    25   -0.0
7  3 MG     2948   4.830  11.56    712   16.686  20684     365   12098    293   .113    41.3    1367   33.1    79   -0.0
8 16 MG     2360   1.270  13.04   1475   14.595   8482     137    1496    286   .077    10.6     115   22.0    25   -0.0
9 C.T.     42668   2.400   4.81     15   11.477   2223     826     939      1   .143   118.2     134     .1     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    10.2     105    7.9
1 IDLE      3148   3.400   9.39     40   13.110   2132      52    1117      2   .232    12.1     259     .5     0   -0.0
2 16 MG     2600   1.180  12.94   1413   14.380   8482     153    1406    277   .077    11.8     108   21.3    25   -0.0
3 10 MG     2674   2.090  12.88   1550   15.187  13200     232    3582    447   .147    34.2     526   65.7    51   -0.0
4 16 MG     2435   1.260  13.05   1500   14.553   8482     142    1483    290   .077    10.9     114   22.3    25   -0.0
5 19 MG     2125   1.430  12.97    575   14.612   6305      92    1246     82   .057     5.2      71    4.7    11   -0.0
6 16 MG     2406   1.310  12.99   1580   14.641   8482     140    1544    300   .077    10.8     119   23.1    25   -0.0
7  3 MG     2818   4.480  11.79    820   16.502  20684     353   11343    341   .113    39.9    1282   38.6    79   -0.0
8 16 MG     2293   1.290  13.03   1475   14.644   8482     134    1519    285   .077    10.3     117   22.0    25   -0.0
9 C.T.     41887   2.450   4.96     15   11.644   2223     803     944      1   .143   114.8     136     .1     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    10.0     109    7.9
1 IDLE      3394   3.120  10.06     50   13.519   2132      54     994      3   .232    12.4     231     .6     0   -0.0
2 16 MG     2601   1.290  12.87   1412   14.920   8482     153    1533    276   .077    11.8     118   21.2    25   -0.0
3 10 MG     2641   1.770  12.99   1763   14.974  13200     233    3152    516   .147    34.2     463   75.8    51   -0.0
4 16 MG     2435   1.360  12.95   1463   14.553   8482     142    1601    283   .077    10.9     123   21.8    25   -0.0
5 19 MG     2066   1.240  13.03    593   14.477   6305      90    1091     86   .057     5.1      62    4.9    11   -0.0
6 16 MG     2747   1.440  12.91   1463   14.625   8482     159    1687    282   .077    12.3     130   21.7    25   -0.0
7  3 MG     3428   5.040  11.43    720   16.613  20684     422   12528    294   .113    47.7    1415   33.2    79   -0.0
8 16 MG     2836   1.520  12.99   1900   14.794   8482     163    1760    266   .077    12.5     136   20.5    25   -0.0
9 C.T.     44840   2.340   6.08     20   12.904   2223     772     814      1   .143   110.5     116     .2     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    10.3     112    8.0
1 IDLE      3394   3.120  10.06     50   13.519   2132      54     994      3   .232    12.4     231     .6     0   -0.0
2 16 MG     2805   1.270  12.90   1412   14.951   8482     165    1506    275   .077    12.7     116   21.2    25   -0.0
3 10 MG     2841   1.880  12.87   1675   15.034  13200     249    3334    488   .147    36.7     490   71.8    51   -0.0
4 16 MG     2608   1.570  12.90   1425   14.731   8482     150    1826    272   .077    11.6     141   21.0    25   -0.0
5 19 MG     2441   1.770  12.88    450   14.894   6305     103    1514     91   .057     5.9      86    5.2    11   -0.0
6 16 MG     2664   1.510  12.93   1600   14.706   8482     154    1759    306   .077    11.8     135   23.6    25   -0.0
7  3 MG     3112   5.050  11.96    700   16.821  20684     382   12544    286   .113    43.2    1417   32.3    79   -0.0
8 16 MG     2521   1.350  13.05   1713   14.652   8482     146    1579    329   .077    11.2     122   25.4    25   -0.0
9 C.T.     46213   2.440   5.10     15   12.161   2223     845     901      1   .143   120.8     129     .1     0   -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    10.7     115    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------    10.1     107    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------    10.5     113    8.0
FOUR CYCLE COMPOSITE =
                                      HC- FID  0.35(   10.1) + 0.65(   10.5) =   10.337   GM/BHP HR
                                      CO- NDIR 0.35(  107.1) + 0.65(  113.2) =  111.050   GM/BHP HR
                                      NO2-CL   0.35(    7.9) + 0.65(    8.0) =    7.991   GM/BHP HR
                                                         CORRECTED NO2 =    8.671   GM/BHP HR
                                                                  BSFC =     .711   LB/BHP HR
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                          TABLE E-7. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 5-0   TEST 32 RUN 3    1972 STANDARD (S)     06-22-73      K =1.053      HUM = 94.4  GR/LB
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                  CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE              HC        CO     CO2     NO    CARBON    CONS.      HC       CO      NO2    FACT.    HC       CO      NO2      HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE           137     3.710    9.56    149    13.418    2132       24     1191       8     .232     5.6     276      1.8      0    -0.0
2 16 HG          118     1.020   13.08   1607    14.227    8482       76     1228     318     .077     5.9      95     24.5     25    -0.0
3 10 HG          129     1.910   13.01   1885    15.059   13200      117     3383     549     .147    17.3     497     80.7     51    -0.0
4 16 HG          106     1.220   13.16   1672    14.494    8482       67     1442     325     .077     5.2     111     25.0     25    -0.0
5 19 HG           84     1.340   13.13    735    14.561    6305       39     1172     106     .057     2.2      67      6.0     11    -0.0
6 16 HG          111     1.320   13.18   1673    14.620    8482       70     1547     322     .077     5.4     119     24.8     25    -0.0
7  3 HG          137     5.240   11.62    929    17.008   20684      180    12873     375     .113    20.3    1455     42.4     79    -0.0
8 16 HG          114     1.630   13.11   1615    14.863    8482       70     1879     306     .077     5.4     145     23.6     25    -0.0
9 C.T.          3666     2.560    4.96    156    11.479    2223      767     1001      10     .143   109.6     143      1.4      0    -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     7.1     116      9.2
1 IDLE           137     3.720    3.56    149     7.428    2132       42     2157      14     .232     9.9     500      3.3      0    -0.0
2 16 HG           23     1.560   13.12   1543    14.705    8482       14     1818     295     .077     1.1     140     22.8     25    -0.0
3 10 HG           19     1.880   13.09   1722    14.991   13200       18     3355     505     .147     2.7     493     74.2     51    -0.0
4 16 HG           19     1.450   13.26   1581    14.731    8482       12     1687     302     .077      .9     130     23.3     25    -0.0
5 19 HG           19     1.560   13.19    670    14.771    6305        9     1345      95     .057      .5      77      5.4     11    -0.0
6 16 HG           19     1.450   13.26   1576    14.731    8482       12     1687     301     .077      .9     130     23.2     25    -0.0
7  3 HG          139     5.170   11.69    823    17.005   20684      176    12703     332     .113    19.9    1435     37.5     79    -0.0
8 16 HG          114     1.640   13.11   1534    14.873    8482       70     1889     290     .077     5.4     145     22.4     25    -0.0
9 C.T.          3534     2.380    5.44    132    11.657    2223      729      918       8     .143   104.3     131      1.2      0    -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     5.8     127      8.5
1 IDLE           144     3.340   10.25    149    13.746    2132       24     1046       8     .232     5.6     243      1.8      0    -0.0
2 16 HG          123     1.130   13.07   1595    14.333    8482       79     1351     313     .077     6.1     104     24.1     25    -0.0
3 10 HG          126     1.710   13.15   1944    14.996   13200      120     3040     568     .147    17.6     447     83.5     51    -0.0
4 16 HG          112     1.200   13.21   1669    14.531    8482       71     1416     322     .077     5.4     109     24.8     25    -0.0
5 19 HG           87      .830   13.30    764    14.224    6305       42      743     115     .057     2.4      42      6.6     11    -0.0
6 16 HG          110     1.090   13.20   1639    14.409    8482       70     1296     320     .077     5.4     100     24.7     25    -0.0
7  3 HG          142     4.780   11.87    971    16.803   20684      189    11886     397     .113    21.3    1343     44.8     79    -0.0
8 16 HG          116     1.250   13.26   1605    14.635    8482       73     1463     309     .077     5.6     113     23.8     25    -0.0
9 C.T.          3713     2.320    5.16    147    11.490    2223      776      907       9     .143   110.9     130      1.4      0    -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     7.2     105      9.4
1 IDLE           144     3.340   10.25    149    13.746    2132       24     1046       8     .232     5.6     243      1.8      0    -0.0
2 16 HG          123      .950   13.09   1682    14.173    8482       80     1148     334     .077     6.1      88     25.7     25    -0.0
3 10 HG          125     1.600   13.17   1988    14.905   13200      120     2862     585     .147    17.6     421     85.9     51    -0.0
4 16 HG          115     1.060   13.20   1772    14.384    8482       73     1263     347     .077     5.6      97     26.7     25    -0.0
5 19 HG           87      .970   13.27    752    14.334    6305       41      862     110     .057     2.4      49      6.3     11    -0.0
6 16 HG          108      .900   13.22   1803    14.237    8482       69     1083     357     .077     5.4      83     27.5     25    -0.0
7  3 HG          141     4.780   11.87    993    16.802   20684      187    11886     406     .113    21.2    1343     45.9     79    -0.0
8 16 HG          114     1.200   13.24   1706    14.563    8482       72     1412     330     .077     5.5     109     25.4     25    -0.0
9 C.T.          3752     2.300    5.23    190    11.582    2223      778      892      12     .143   111.2     128      1.7      0    -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     7.2     102      9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     6.4     122      8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     7.2     104      9.6
FOUR CYCLE COMPOSITE -
                                        HC- NDIR 0.35(     6.4) + 0.65(     7.2) =    6.945   GM/BHP HR
                                        CO- NDIR 0.35(   121.8) + 0.65(   103.8) =  110.085   GM/BHP HR
                                        NO2-NDIR 0.35(     8.9) + 0.65(     9.6) =    9.372   GM/BHP HR
                                                          CORRECTED NO2 =    9.873   GM/BHP HR
                                                                   BSFC =     .711   LB/BHP HR


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                  CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE            HC-FID      CO     CO2  NO-CL    CARBON    CONS.      HC       CO      NO2    FACT.  HC-FID     CO   NO2-CL    HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE          3593     3.710    9.56     45    13.629    2132       56     1172       2     .232    13.0     272       .5      0    -0.0
2 16 HG         2815     1.020   13.08   1450    14.381    8482      166     1215     284     .077    12.8      94     21.9     25    -0.0
3 10 HG         2987     1.910   13.01   1709    15.219   13200      259     3346     491     .147    38.1     492     72.1     51    -0.0
4 16 HG         2634     1.220   13.16   1508    14.643    8482      153     1427     290     .077    11.7     110     22.3     25    -0.0
5 19 HG         2211     1.340   13.13    609    14.691    6305       95     1162      86     .057     5.4      66      4.9     11    -0.0
6 16 HG         2410     1.320   13.18   1517    14.741    8482      139     1534     290     .077    10.7     118     22.3     25    -0.0
7  3 HG         3133     5.240   11.62    771    17.173   20684      377    12749     308     .113    42.6    1441     34.8     79    -0.0
8 16 HG         2699     1.630   13.11   1484    15.010    8482      153     1861     273     .077    11.7     143     21.0     25    -0.0
9 C.T.         44494     2.560    4.96     18    11.969    2223      826      960       1     .143   118.2     137       .2      0    -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    10.6     115      8.0
1 IDLE          3415     3.720    3.56     45     7.622    2132       96     2102       4     .232    22.2     488      1.0      0    -0.0
2 16 HG         3407     1.560   13.12   1450    15.021    8482      192     1779     272     .077    14.8     137     20.9     25    -0.0
3 10 HG         2959     1.880   13.09   1550    15.266   13200      257     3294     446     .147    37.7     484     65.6     51    -0.0
4 16 HG         2613     1.450   13.26   1425    14.971    8482      148     1659     268     .077    11.4     128     20.6     25    -0.0
5 19 HG         2301     1.560   13.19    550    14.980    6305       97     1326      77     .057     5.5      76      4.4     11    -0.0
6 16 HG         2613     1.450   13.26   1450    14.971    8482      148     1659     273     .077    11.4     128     21.0     25    -0.0
7  3 HG         3063     5.170   11.69    700    17.166   20684      369    12583     280     .113    41.7    1422     31.6     79    -0.0
8 16 HG         2671     1.640   13.11   1362    15.017    8482      151     1871     256     .077    11.6     144     19.7     25    -0.0
9 C.T.         40749     2.380    5.44     15    11.898    2223      762      898       1     .143   108.9     128       .1      0    -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    10.6     125      7.4
1 IDLE          3473     3.340   10.25     50    13.937    2132       53     1032       3     .232    12.3     239       .6      0    -0.0
2 16 HG         2642     1.130   13.07   1413    14.464    8482      155     1339     275     .077    11.9     103     21.2     25    -0.0
3 10 HG         2701     1.710   13.15   1775    15.130   13200      236     3014     514     .147    34.6     443     75.6     51    -0.0
4 16 HG         2408     1.200   13.21   1500    14.651    8482      139     1403     288     .077    10.7     108     22.2     25    -0.0
5 19 HG         2007      .830   13.30    663    14.331    6305       88      738      97     .057     5.0      42      5.5     11    -0.0
6 16 HG         2304     1.090   13.20   1475    14.520    8482      135     1286     286     .077    10.4      99     22.0     25    -0.0
7  3 HG         3375     4.780   11.87    800    16.988   20684      411    11757     323     .113    46.4    1328     36.5     79    -0.0
8 16 HG         2779     1.250   13.26   1475    14.788    8482      159     1448     281     .077    12.3     112     21.6     25    -0.0
9 C.T.         38491     2.320    5.16     20    11.329    2223      755      920       1     .143   108.0     131       .2      0    -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    10.1     104      8.2
1 IDLE          3473     3.340   10.25     50    13.937    2132       53     1032       3     .232    12.3     239       .6      0    -0.0
2 16 HG         2881      .950   13.09   1487    14.328    8482      171     1136     292     .077    13.1      87     22.5     25    -0.0
3 10 HG         3029     1.600   13.17   1788    15.073   13200      265     2830     520     .147    39.0     416     76.4     51    -0.0
4 16 HG         2660     1.060   13.20   1600    14.526    8482      155     1250     310     .077    12.0      96     23.9     25    -0.0
5 19 HG         2179      .970   13.27    600    14.458    6305       95      854      87     .057     5.4      49      5.0     11    -0.0
6 16 HG         2572      .900   13.22   1625    14.377    8482      152     1073     318     .077    11.7      83     24.5     11    -0.0
7  3 HG         3205     4.780   11.87    813    16.970   20684      391    11768     329     .113    44.1    1330     37.2     79    -0.0
8 16 HG         2653     1.200   13.24   1525    14.705    8482      153     1398     292     .077    11.8     108     22.5     25    -0.0
9 C.T.         41075     2.300    5.23     20    11.637    2223      786      887       1     .143   112.2     127       .2      0    -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    10.6     101      8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    10.6     120      7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    10.3     103      8.4
FOUR CYCLE COMPOSITE -
                                        HC- FID  0.35(    10.6) + 0.65(    10.3) =   10.378   GM/BHP HR
                                        CO- NDIR 0.35(   120.1) + 0.65(   102.8) =  108.857   GM/BHP HR
                                        NO2-CL   0.35(     7.7) + 0.65(     8.4) =    8.129   GM/BHP HR
                                                          CORRECTED NO2 =    8.564   GM/BHP HR
                                                                   BSFC =     .711   LB/BHP HR
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                         TABLE E-8. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 5-0X  TEST-21  RUN-1   1972 ENGINE-75 CARB.  05-21-73      K =1.023      HUM = 82.8  GR/LB
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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR            MAN.
              HC      CO     CO2      NO    CARBON    CONS.       HC      CO     NO2     FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE       140   2.330    9.88      97    12.361     2313       28     881       6     .232     6.6      204     1.4     0   17.4
2 16 HG      112    .380   13.88    1249    14.381     7620       64     407     220     .077     4.9       31    16.9    24   16.0
3 10 HG       93    .400   14.03    1813    14.530    11159       77     621     462     .147    11.3       91    68.0    96   10.0
4 16 HG      102    .580   14.03    1331    14.720     7620       57     606     229     .077     4.4       47    17.6    24   16.0
5 19 HG       72    .490   14.03     511    14.598     5534       29     375      64     .057     1.7       21     3.7     9   19.0
6 16 HG      102    .520   14.03    1465    14.660     7620       57     546     253     .077     4.4       42    19.5    24   16.0
7  3 HG      145   3.420   12.86    1185    16.437    18598      177    7817     445     .113    20.0      883    50.3    78    3.0
8 16 HG      102    .650   14.10    1417    14.860     7620       56     673     241     .077     4.3       52    18.6    24   16.0
9 C.T.      3094   1.440    6.61     118    11.392     2268      665     579       8     .143    95.1       83     1.1     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     6.4       61     8.3
1 IDLE       140   2.330    9.88      97    12.361     2313       28     881       6     .232     6.6      204     1.4     0   17.4
2 16 HG      126    .530   13.88    1388    14.546     7620       71     561     241     .077     5.5       43    18.6    24   16.0
3 10 HG       88    .360   13.88    1922    14.338    11159       74     566     497     .147    10.9       83    73.0    96   10.0
4 16 HG       98    .440   14.03    1407    14.576     7620       55     465     244     .077     4.3       36    18.8    24   16.0
5 19 HG       70    .480   14.03     483    14.586     5534       29     368      61     .057     1.6       21     3.5     9   19.0
6 16 HG      100    .470   14.03    1465    14.608     7620       56     495     254     .077     4.3       38    19.5    24   16.0
7  3 HG      148   3.300   12.86    1221    16.320    18598      182    7597     462     .113    20.6      858    52.2    78    3.0
8 16 HG      110    .600   14.03    1504    14.749     7620       61     626     258     .077     4.7       48    19.9    24   16.0
9 C.T.      3185   1.390    6.45     135    11.280     2268      692     565       9     .143    98.9       81     1.3     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     6.6       59     8.8
1 IDLE       131   1.940   10.56     103    12.641     2313       26     717       6     .232     6.0      166     1.5     0   17.4
2 16 HG      123    .520   13.88    1436    14.533     7620       70     551     250     .077     5.4       42    19.2    24   16.0
3 10 HG       98    .480   13.88    1967    14.466    11159       82     748     504     .147    12.0      110    74.1    96   10.0
4 16 HG      102    .480   14.03    1564    14.620     7620       57     505     271     .077     4.4       39    20.8    24   16.0
5 19 HG       70    .490   14.03     497    14.596     5534       29     375      63     .057     1.6       21     3.6     9   19.0
6 16 HG      102    .560   14.03    1544    14.700     7620       57     586     266     .077     4.4       45    20.5    24   16.0
7  3 HG      150   3.190   12.86    1258    16.212    18598      186    7392     479     .113    21.0      835    54.1    78    3.0
8 16 HG      107    .650   14.03    1529    14.796     7620       60     676     261     .077     4.6       52    20.1    24   16.0
9 C.T.      3003   1.390    6.78     130    11.413     2268      644     558       9     .143    92.2       80     1.2     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     6.4       59     9.0
1 IDLE       131   1.940   10.56     110    12.641     2313       26     717       7     .232     6.0      166     1.6     0   17.4
2 16 HG      112    .480   13.88    1407    14.481     7620       64     510     246     .077     4.9       39    18.9    24   16.0
3 10 HG       91    .390   13.73    2012    14.218    11159       77     618     524     .147    11.3       91    77.1    96   10.0
4 16 HG       98    .470   14.03    1524    14.606     7620       55     495     264     .077     4.3       38    20.3    24   16.0
5 19 HG       68    .520   14.00     526    14.593     5534       28     398      66     .057     1.6       23     3.8     9   19.0
6 16 HG      102    .470   14.00    1584    14.580     7620       58     496     275     .077     4.4       38    21.2    24   16.0
7  3 HG      152   3.140   12.88    1313    16.184    18598      189    7289     501     .113    21.3      824    56.6    78    3.0
8 16 HG      102    .620   14.03    1407    14.760     7620       57     647     241     .077     4.4       50    18.6    24   16.0
9 C.T.      2913   1.330    7.12     122    11.596     2268      615     525       8     .143    88.0       75     1.1     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     6.2       57     9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     6.5       60     8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     6.3       58     9.1
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(      6.5) + 0.65(      6.3) =     6.356   GM/BHP HR
                                    CO- NDIR 0.35(     60.3) + 0.65(     57.6) =    58.528   GM/BHP HR
                                    NO2-NDIR 0.35(      8.5) + 0.65(      9.1) =     8.921   GM/BHP HR
                                                           CORRECTED NO2 =     9.129   GM/BHP HR
                                                                    BSFC =      .674   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR         WT.       WEIGHTED GM/HR            MAN.
            HC-FID     CO     CO2   NO-CL   CARBON    CONS.       HC      CO     NO2     FACT.  HC-FID      CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE      3361   2.330    9.88      48    12.546     2313       62     868       3     .232    14.4      201      .7     0   17.4
2 16 HG     2717    .380   13.88    1137    14.532     7620      142     403     198     .077    11.0       31    15.2    24   16.0
3 10 HG     2380    .400   14.03    1700    14.668    11159      181     615     429     .147    26.6       90    63.1    96   10.0
4 16 HG     2679    .580   14.03    1225    14.878     7620      137     600     208     .077    10.6       46    16.0    24   16.0
5 19 HG     1792    .490   14.03     453    14.699     5534       67     373      57     .057     3.8       21     3.2     9   19.0
6 16 HG     2405    .520   14.03    1362    14.791     7620      124     541     233     .077     9.5       42    17.9    24   16.0
7  3 HG     3406   3.420   12.86    1062    16.621    18598      381    7730     396     .113    43.1      874    44.6    78    3.0
8 16 HG     2409    .650   14.10    1271    14.991     7620      122     667     214     .077     9.4       51    16.5    24   16.0
9 C.T.     37058   1.440    6.61      64    11.756     2268      715     561       4     .143   102.2       80      .6     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     9.7       60     7.5
1 IDLE      3361   2.330    9.88      48    12.546     2313       62     868       3     .232    14.4      201      .7     0   17.4
2 16 HG     2403    .530   13.88    1275    14.650     7620      125     557     220     .077     9.6       43    17.0    24   16.0
3 10 HG     1720    .360   13.88    1800    14.412    11159      133     563     463     .147    19.6       83    68.0    96   10.0
4 16 HG     1905    .440   14.03    1312    14.660     7620       99     462     226     .077     7.6       36    17.4    24   16.0
5 19 HG     1361    .480   14.03     437    14.646     5534       51     366      55     .057     2.9       21     3.1     9   19.0
6 16 HG     1905    .470   14.03    1387    14.691     7620       99     492     239     .077     7.6       38    18.4    24   16.0
7  3 HG     2851   3.300   12.86    1125    16.448    18598      322    7539     422     .113    36.4      852    47.7    78    3.0
8 16 HG     1998    .600   14.03    1412    14.830     7620      103     623     241     .077     7.9       48    18.5    24   16.0
9 C.T.     30889   1.390    6.45      75    10.929     2268      641     583       5     .143    91.7       83      .7     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     8.3       59     8.1
1 IDLE      2410   1.940   10.56      62    12.741     2313       44     711       4     .232    10.1      165      .9     0   17.4
2 16 HG     2357    .520   13.88    1358    14.636     7620      123     547     235     .077     9.4       42    18.1    24   16.0
3 10 HG     1903    .480   13.88    1862    14.550    11159      146     744     474     .147    21.5      109    69.7    96   10.0
4 16 HG     1951    .480   14.03    1468    14.705     7620      101     502     253     .077     7.8       39    19.5    24   16.0
5 19 HG     1361    .490   14.03     456    14.656     5534       51     374      57     .057     2.9       21     3.3     9   19.0
6 16 HG     1998    .560   14.03    1450    14.790     7620      103     583     248     .077     7.9       45    19.1    24   16.0
7  3 HG     2766   3.190   12.86    1168    16.326    18598      314    7341     442     .113    35.5      830    49.9    78    3.0
8 16 HG     1993    .650   14.03    1406    14.879     7620      102     672     239     .077     7.9       52    18.4    24   16.0
9 C.T.     28398   1.390    6.78      73    11.010     2268      585     578       5     .143    83.6       83      .7     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     7.9       58     8.4
1 IDLE      2410   1.940   10.56      62    12.741     2313       44     711       4     .232    10.1      165      .9     0   17.4
2 16 HG     2175    .480   13.88    1312    14.578     7620      114     507     228     .077     8.8       39    17.6    24   16.0
3 10 HG     1673    .390   13.73    1845    14.287    11159      131     615     478     .147    19.2       90    70.3    96   10.0
4 16 HG     1905    .470   14.03    1450    14.691     7620       99     492     250     .077     7.6       38    19.2    24   16.0
5 19 HG     1361    .520   14.00     475    14.656     5534       51     397      60     .057     2.9       23     3.4     9   19.0
6 16 HG     1950    .470   14.00    1500    14.665     7620      101     493     259     .077     7.8       38    19.9    24   16.0
7  3 HG     2664   3.140   12.88    1267    16.286    18598      304    7243     480     .113    34.4      818    54.3    78    3.0
8 16 HG     1908    .620   14.03    1330    14.841     7620       98     643     227     .077     7.5       50    17.5    24   16.0
9 C.T.     25013   1.330    7.12      68    10.951     2268      518     556       5     .143    74.1       80      .7     0   24.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     7.3       56     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     9.0       60     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     7.6       57     8.5
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(      9.0) + 0.65(      7.6) =     8.066   GM/BHP HR
                                    CO- NDIR 0.35(     59.8) + 0.65(     57.4) =    58.202   GM/BHP HR
                                    NO2-CL   0.35(      7.8) + 0.65(      8.5) =     8.235   GM/BHP HR
                                                           CORRECTED NO2 =     8.427   GM/BHP HR
                                                                    BSFC =      .674   LB/BHP HR
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TABLE E-9. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 5-OX  TEST-21  RUN-2   1972 ENGINE-75 CARB.  05-22-73      K =1.023      HUM = 82.6  GR/LB
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             CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR           MAN.
MODE         HC      CO      CO2      NO    CARBON    CONS.      HC      CO      NO2    FACT.    HC      CO     NO2    HP     VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE       122   2.020   10.68      85    12.832    2313       24     736       5     .232    5.5    171     1.2     0    17.9
2 16 HG      122    .480   13.73    1332    14.392    7620       70     515     235     .077    5.4     40    18.1    24    16.0
3 10 HG      103    .450   13.88    1666    14.491   11159       86     702     427     .147   12.6    103    62.8    96    10.0
4 16 HG      112    .570   13.92    1427    14.611    7620       63     600     247     .077    4.9     46    19.0    24    16.0
5 19 HG       79    .520   13.88     983    14.485    5539       33     401      61     .057    1.9     23     3.5     9    19.0
6 16 HG      108    .600   13.92    1966    14.537    7620       61     529     255     .077    4.7     41    19.6    24    16.0
7  3 HG      164   3.950   12.59    1045    16.717   18598      197    8877     386     .113   22.3   1003    43.6    78     3.0
8 16 HG      117    .650   14.03    1529    14.806    7620       65     676     260     .077    5.0     52    20.1    24    16.0
9 C.T.      3003   1.350   13.88      48    18.473    2268      398     335       4     .143   56.9     48      .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------  5.0     64     7.9
1 IDLE       122   2.020   10.68      85    12.832    2313       24     736       5     .232    5.5    171     1.2     0    17.9
2 16 HG      126    .450   13.73    1485    14.316    7620       72     484     262     .077    5.6     37    20.2    24    16.0
3 10 HG      103    .570   13.73    1728    14.411   11159       86     892     444     .147   12.7    131    65.3    96    10.0
4 16 HG      117    .670   13.88    1408    14.676    7620       66     703     243     .077    5.1     54    18.7    24    16.0
5 19 HG       94    .720   13.88     570    14.702    5539       38     547      71     .057    2.2     31     4.1     9    19.0
6 16 HG      127    .730   13.88    1389    14.797    7620       71     768     238     .077    5.5     59    18.3    24    16.0
7  3 HG      164   4.470   12.18     799    16.827   18598      196    9980     293     .113   22.1   1128    33.1    78     3.0
8 16 HG      117    .740   13.88    1524    14.796    7620       68     772     261     .077    5.0     59    20.1    24    16.0
9 C.T.      2913   1.350    6.95      48    11.996    2268      623     540       6     .143   89.1     77      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------  6.4     74     7.7
1 IDLE       131   2.130   10.80     123    13.071    2313       25     761       7     .232    5.8    177     1.7     0    17.9
2 16 HG      136    .640   13.73    1389    14.567    7620       77     729     241     .077    5.9     56    18.6    24    16.0
3 10 HG       95    .480   13.73    1792    14.313   11159       80     756     464     .147   11.8    111    68.2    96    10.0
4 16 HG      117    .830   13.88    1332    14.836    7620       65     861     227     .077    5.0     66    17.5    24    16.0
5 19 HG       84    .670   13.88     512    14.691    5539       34     512      64     .057    2.0     29     3.7     9    19.0
6 16 HG      117    .650   13.88    1524    14.686    7620       66     683     263     .077    5.1     53    20.3    24    16.0
7  3 HG      155   3.350   12.72    1222    16.237   18598      192    7751     465     .113   21.7    876    52.5    78     3.0
8 16 HG      108    .570   13.88    1370    14.567    7620       61     602     238     .077    4.7     46    18.3    24    16.0
9 C.T.      3003   1.330    6.78     110    11.358    2268      648     537       7     .143   92.6     77     1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------  6.5     63     8.5
1 IDLE       131   2.130   10.80     123    13.071    2313       25     761       7     .232    5.8    177     1.7     0    17.9
2 16 HG      127    .500   13.58    1427    14.217    7620       74     541     254     .077    5.7     42    19.6    24    16.0
3 10 HG       98    .470   13.58    1792    14.156   11159       83     748     469     .147   12.3    110    68.9    96    10.0
4 16 HG      112    .680   13.73    1408    14.531    7620       63     720     245     .077    4.9     55    18.9    24    16.0
5 19 HG       81    .670   13.73     512    14.487    5539       33     517      65     .057    1.9     29     3.7     9    19.0
6 16 HG      112    .690   13.72    1584    14.431    7620       64     629     278     .077    4.9     48    21.4    24    16.0
7  3 HG      150   3.420   12.59    1168    16.172   18598      186    7945     446     .113   21.1    898    50.4    78     3.0
8 16 HG      117    .650   13.80    1544    14.576    7620       66     686     268     .077    5.1     53    20.6    24    16.0
9 C.T.      2913   1.330    7.12     110    11.596    2268      615     525       7     .143   88.0     75     1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------  6.3     63     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------  5.7     69     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------  6.4     63     8.6
FOUR CYCLE COMPOSITE -               HC- NDIR 0.35(     5.7) + 0.65(     6.4) =    6.161   GM/BHP HR
                                     CO- NDIR 0.35(    68.9) + 0.65(    62.7) =   64.838   GM/BHP HR
                                     NO2-NDIR 0.35(     7.8) + 0.65(     8.6) =    8.306   GM/BHP HR
                                                          CORRECTED NO2 =    8.494   GM/BHP HR
                                                                   BSFC =     .674   LB/BHP HR
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             CONCENTRATION AS MEASURED       TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE        HC-FID    CO      CO2    NO-CL   CARBON    CONS.      HC      CO      NO2    FACT.  HC-FID    CO   NO2-CL  HP     VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE       2905   2.020   10.68      50    12.991    2313       52     727       3     .232    12.0    169      .7     0    17.9
2 16 HG      2806    .480   13.73    1238    14.491    7620      148     510     216     .077    11.4     39    16.6    24    16.0
3 10 HG      2310    .450   13.88    1575    14.861   11159      177     697     401     .147    26.0    102    58.9    96    10.0
4 16 HG      2586    .570   13.92    1325    14.749    7620      134     595     227     .077    10.3     46    17.5    24    16.0
5 19 HG      1813    .520   13.88     425    14.581    5539       69     399      54     .057     3.9     23     3.1     9    19.0
6 16 HG      2627    .500   13.92    1350    14.673    7620      131     525     233     .077    10.1     40    17.9    24    16.0
7  3 HG      3505   3.950   12.59     980    16.891   18598      386    8786     347     .113    43.6    993    39.2    78     3.0
8 16 HG      2453    .650   14.03    1420    14.925    7620      125     670     241     .077     9.6     52    18.5    24    16.0
9 C.T.      33924   1.350   13.88      82    18.622    2268      413     330       3     .143    59.1     47      .5     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------  7.8     64     7.3
1 IDLE       2905   2.020   10.68      50    12.991    2313       52     727       3     .232    12.0    169      .7     0    17.9
2 16 HG      2353    .450   13.73    1363    14.415    7620      124     481     239     .077     9.6     37    18.4    24    16.0
3 10 HG      1993    .570   13.73    1550    14.499   11159      153     886     396     .147    22.5    130    58.2    96    10.0
4 16 HG      2269    .670   13.88    1300    14.777    7620      117     698     223     .077     9.0     54    17.1    24    16.0
5 19 HG      1907    .720   13.88     513    14.791    5539       71     544      64     .057     4.1     31     3.6     9    19.0
6 16 HG      2361    .730   13.89    1288    14.896    7620      121     757     219     .077     9.3     58    16.9    24    16.0
7  3 HG      3093   4.470   12.18     775    16.959   18598      339    9902     282     .113    38.3   1119    31.9    78     3.0
8 16 HG      2270    .740   13.88    1400    14.847    7620      117     767     239     .077     9.0     59    18.4    24    16.0
9 C.T.      29339   1.350    6.95      60    11.234    2268      592     551       4     .143    84.7     79      .6     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------  8.4     73     7.0
1 IDLE       2732   2.130   10.80      63    13.203    2313       48     754       4     .232    11.1    175      .9     0    17.9
2 16 HG      2765    .690   13.73    1287    14.697    7620      143     723     222     .077    11.0     56    17.1    24    16.0
3 10 HG      1991    .480   13.73    1687    14.409   11159      154     751     434     .147    22.7    110    63.8    96    10.0
4 16 HG      2494    .830   13.88    1238    14.960    7620      127     854     209     .077     9.8     66    16.1    24    16.0
5 19 HG      1861    .670   13.88     463    14.736    5539       70     508      58     .057     4.0     29     3.3     9    19.0
6 16 HG      2019    .650   13.88    1413    14.738    7620      104     679     243     .077     8.0     52    18.7    24    16.0
7  3 HG      3124   3.350   12.72    1129    16.382   18598      355    7682     424     .113    40.1    868    47.9    78     3.0
8 16 HG      2131    .570   13.88    1275    14.663    7620      111     598     220     .077     8.5     46    16.9    24    16.0
9 C.T.      30551   1.330    6.78      74    11.165    2268      621     546       5     .143    88.7     78      .7     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------  8.6     62     7.8
1 IDLE       2732   2.130   10.80      63    13.203    2313       48     754       4     .232    11.1    175      .9     0    17.9
2 16 HG      2532    .500   13.58    1325    14.333    7620      135     537     234     .077    10.4     41    18.0    24    16.0
3 10 HG      1989    .470   13.58    1688    14.249   11159      156     744     439     .147    22.9    109    64.5    96    10.0
4 16 HG      2267    .680   13.73    1313    14.637    7620      118     715     227     .077     9.1     55    17.5    24    16.0
5 19 HG      1700    .670   13.73     438    14.570    5539       65     514      55     .057     3.7     29     3.1     9    19.0
6 16 HG      2355    .590   13.72    1463    14.546    7620      123     624     254     .077     9.5     48    19.6    24    16.0
7  3 HG      3031   3.420   12.59    1090    16.313   18598      346    7876     413     .113    39.0    890    46.6    78     3.0
8 16 HG      2267    .650   13.80    1438    14.677    7620      119     682     248     .077     9.1     52    19.1    24    16.0
9 C.T.      29988   1.330    7.12      92    11.499    2268      594     532       6     .143    85.0     76      .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------  8.4     62     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------  8.1     68     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------  8.5     62     7.9
FOUR CYCLE COMPOSITE -               HC- FID  0.35(     8.1) + 0.65(     8.5) =    8.353   GM/BHP HR
                                     CO- NDIR 0.35(    68.3) + 0.65(    62.2) =   64.341   GM/BHP HR
                                     NO2-CL   0.35(     7.1) + 0.65(     7.9) =    7.630   GM/BHP HR
                                                          CORRECTED NO2 =    7.802   GM/BHP HR
                                                                   BSFC =     .674   LB/BHP HR
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                    TABLE E-10. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 5-0A  TEST-21  RUN-4   1972 ENGINE-75 CARB.  05-22-73      K =1.034      HUM = 86.6  GR/LB
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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR            MAN.
MODE        HC      CO     CO2     NO   CARBON   CONS.     HC      CO    NO2   FACT.   HC      CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------
1 IDLE     127   2.050   10.80     85   12.987    2313     24     738      5   .232    5.7    171    1.2     0   18.0
2 16 HG    127    .520   14.03   1222   14.687    7620     71     595    210   .077    5.5     46   16.2    24   16.0
3 10 HG    103    .370   14.18   1666   14.661   11159     85     569    421   .147   12.4     84   61.9    46   10.0
4 16 HG    112    .550   14.33   1370   15.001    7620     61     564    231   .077    4.7     43   17.8    24   16.0
5 19 HG     79    .500   14.18    512   14.765    5534     32     379     64   .057    1.8     22    3.6     9   19.0
6 16 HG    112    .540   14.18   1389   14.841    7620     62     560    237   .077    4.8     43   18.2    24   16.0
7  3 HG    160   3.560   12.86   1079   16.593   18598    194    8060    402   .113   21.9    911   45.4    78    3.0
8 16 HG    112    .680   14.33   1370   15.131    7620     61     692    229   .077    4.7     53   17.6    24   16.0
9 C.T.    3186   1.390    6.96     80   11.791    2268    662     540      5   .143   94.6     77     .7     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.6     61    7.7
1 IDLE     127   2.050   10.80     85   12.987    2313     24     738      5   .232    5.7    171    1.2     0   18.0
2 16 HG    127    .570   14.03   1427   14.737    7620     71     595    245   .077    5.5     46   18.9    24   16.0
3 10 HG    103    .520   14.18   1835   14.811   11159     84     791    459   .147   12.3    116   67.5    46   10.0
4 16 HG    112    .690   14.18   1332   14.991    7620     61     708    225   .077    4.7     55   17.3    24   16.0
5 19 HG     82    .570   14.18    526   14.839    5534     33     429     65   .057    1.9     24    3.7     9   19.0
6 16 HG    112    .750   14.18   1389   15.051    7620     61     767    233   .077    4.7     59   18.0    24   16.0
7  3 HG    160   3.900   12.72    911   16.793   18598    191    8725    335   .113   21.6    986   37.9    78    3.0
8 16 HG    117    .720   14.18   1408   15.026    7620     64     738    237   .077    4.9     57   18.3    24   16.0
9 C.T.    3004   1.390    7.30     82   11.934    2268    617     534      5   .143   88.2     76     .7     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.3     67    7.7
1 IDLE     131   1.860   11.41     85   13.411    2313     24     648      5   .232    5.7    150    1.1     0   18.0
2 16 HG    131    .650   14.03   1446   14.821    7620     73     678    247   .077    5.6     52   19.0    24   16.0
3 10 HG    103    .580   14.18   1792   14.871   11159     83     879    446   .147   12.3    129   65.6    46   10.0
4 16 HG    117    .670   14.18   1351   14.976    7620     64     689    228   .077    5.0     53   17.6    24   16.0
5 19 HG     84    .690   14.18    464   14.961    5534     34     516     58   .057    1.9     29    3.3     9   19.0
6 16 HG    112    .650   14.18   1466   14.951    7620     62     669    248   .077    4.7     52   19.1    24   16.0
7  3 HG    155   3.320   13.00   1204   16.487   18598    189    7565    451   .113   21.3    855   51.0    78    3.0
8 16 HG    108    .630   14.18   1389   14.927    7620     60     650    235   .077    4.6     50   18.1    24   16.0
9 C.T.    3231   1.300    7.12     79   11.909    2268    665     500      5   .143   95.0     72     .7     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.6     61    8.2
1 IDLE     131   1.860   11.41     85   13.411    2313     24     648      5   .232    5.7    150    1.1     0   18.0
2 16 HG    127    .510   14.03   1446   14.677    7620     71     535    249   .077    5.5     41   19.2    24   16.0
3 10 HG    103    .420   14.03   1900   14.561   11159     85     650    483   .147   12.5     96   71.1    46   10.0
4 16 HG    108    .580   14.18   1400   14.877    7620     60     600    239   .077    4.6     46   18.4    24   16.0
5 19 HG     75    .500   14.18    498   14.761    5534     30     379     62   .057    1.7     22    3.5     9   19.0
6 16 HG    103    .560   14.18   1408   14.851    7620     57     570    240   .077    4.4     44   18.5    24   16.0
7  3 HG    164   3.850   12.72    928   16.747   18598    197    8637    342   .113   22.2    976   38.7    78    3.0
8 16 HG    117    .720   14.18   1505   15.026    7620     64     738    253   .077    4.9     57   19.5    24   16.0
9 C.T.    3003   1.330    7.37     85   11.943    2268    616     510      5   .143   88.1     73     .8     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.3     63    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    6.4     64    7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    6.4     62    8.1
FOUR CYCLE COMPOSITE -
                                   HC- NDIR 0.35(    6.4) + 0.65(    6.4) =    6.432   GM/BHP HR
                                   CO- NDIR 0.35(   63.9) + 0.65(   62.0) =   62.653   GM/BHP HR
                                   NO2-NDIR 0.35(    7.7) + 0.65(    8.1) =    7.978   GM/BHP HR
                                                          CORRECTED NO2 =    8.248   GM/BHP HR
                                                                   BSFC =     .674   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR            MAN.
MODE       HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC      CO    NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------
1 IDLE    3222   2.050   10.80     50   13.172    2313     57     727      3   .232   13.1    169     .7     0   18.0
2 16 HG   2723    .520   14.03   1162   14.822    7620    140     590    198   .077   10.8     45   15.3    24   16.0
3 10 HG   2088    .370   14.18   1600   14.759   11159    158     565    402   .147   23.2     83   59.0    46   10.0
4 16 HG   2275    .550   14.33   1325   15.108    7620    115     560    222   .077    8.8     43   17.1    24   16.0
5 19 HG   1590    .500   14.18    500   14.839    5534     59     377     62   .057    3.4     21    3.5     9   19.0
6 16 HG   2181    .540   14.18   1350   14.938    7620    111     556    229   .077    8.6     43   17.6    24   16.0
7  3 HG   3018   3.560   12.86    987   16.722   18598    336    7998    364   .113   37.9    904   41.2    78    3.0
8 16 HG   2095    .680   14.33   1818   15.220    7620    105     688    218   .077    8.1     53   16.8    24   16.0
9 C.T.   33610   1.390    6.96     90   11.711    2268    651     544      6   .143   93.1     78     .8     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    8.7     60    7.2
1 IDLE    3222   2.050   10.80     50   13.172    2313     57     727      3   .232   13.1    169     .7     0   18.0
2 16 HG   2815    .570   14.03   1400   14.881    7620    144     590    238   .077   11.1     45   18.3    24   16.0
3 10 HG   2227    .520   14.18   1825   14.923   11159    166     785    453   .147   24.5    115   66.6    46   10.0
4 16 HG   2594    .690   14.18   1312   15.129    7620    131     702    219   .077   10.1     54   16.9    24   16.0
5 19 HG   1818    .570   14.18    500   14.932    5534     67     407     62   .057    3.8     23    3.5     9   19.0
6 16 HG   2595    .750   14.18   1362   15.189    7620    130     760    227   .077   10.0     59   17.5    24   16.0
7  3 HG   3507   3.900   12.72    887   16.971   18598    384    8633    323   .113   43.4    976   36.5    78    3.0
8 16 HG   2549    .720   14.18   1387   15.155    7620    128     731    232   .077    9.9     56   17.8    24   16.0
9 C.T.   32844   1.390    7.30     87   11.974    2268    622     532      5   .143   89.0     76     .8     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    9.0     66    7.5
1 IDLE    2627   1.860   11.41     62   13.533    2313     47     642      4   .232   10.9    149     .8     0   18.0
2 16 HG   2680    .650   14.03   1387   14.948    7620    137     669    235   .077   10.5     52   18.1    24   16.0
3 10 HG   2091    .580   14.18   1837   14.969   11159    156     873    455   .147   22.9    128   66.8    46   10.0
4 16 HG   2354    .670   14.18   1345   15.085    7620    119     684    226   .077    9.2     53   17.4    24   16.0
5 19 HG   1775    .690   14.18    450   15.047    5534     65     513     55   .057    3.7     29    3.1     9   19.0
6 16 HG   2365    .650   14.18   1337   15.067    7620    120     669    224   .077    9.2     51   17.3    24   16.0
7  3 HG   3131   3.320   13.00   1162   16.633   18598    350    7499    431   .113   39.6    847   48.7    78    3.0
8 16 HG   2274    .630   14.18   1381   15.037    7620    115     695    232   .077    8.9     54   17.9    24   16.0
9 C.T.   30181   1.300    7.12     84   11.438    2268    598     521      6   .143   85.6     74     .8     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    8.4     60    8.0
1 IDLE    2627   1.860   11.41     62   13.533    2313     45     642      4   .232   10.4    149     .8     0   18.0
2 16 HG   2541    .510   14.03   1375   14.794    7620    131     531    235   .077   10.1     41   18.1    24   16.0
3 10 HG   2018    .420   14.03   1918   14.652   11159    154     646    485   .147   22.6     95   71.1    46   10.0
4 16 HG   2182    .580   14.18   1375   14.978    7620    111     596    232   .077    8.5     46   17.9    24   16.0
5 19 HG   1477    .500   14.18    500   14.828    5534     55     377     62   .057    3.1     21    3.5     9   19.0
6 16 HG   2182    .560   14.18   1387   14.958    7620    111     566    235   .077    8.6     44   18.1    24   16.0
7  3 HG   3137   3.850   12.72    918   16.884   18598    346    8567    336   .113   39.0    968   37.9    78    3.0
8 16 HG   2276    .720   14.18   1487   15.128    7620    115     733    249   .077    8.8     56   19.1    24   16.0
9 C.T.   31982   1.330    7.37     75   11.898    2268    610     512      5   .143   87.2     73     .7     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    8.3     63    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    8.9     63    7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    8.4     62    8.0
FOUR CYCLE COMPOSITE -
                                   HC- FID  0.35(    8.9) + 0.65(    8.4) =    8.554   GM/BHP HR
                                   CO- NDIR 0.35(   63.3) + 0.65(   61.6) =   62.189   GM/BHP HR
                                   NO2-CL   0.35(    7.4) + 0.65(    8.0) =    7.756   GM/BHP HR
                                                          CORRECTED NO2 =    8.019   GM/BHP HR
                                                                   BSFC =     .674   LB/BHP HR
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                          TABLE E-11.MASS EMISSIONS BY NINE-MODE FTP
ENGINE S-1   TEST 24  RUN-1   EGR-AIR-CAT            05-29-73       K = .980      HUM = 69.1  GR/LB
----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE          HC      CO     CO2      NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC       CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        23    .010    9.88      73    9.915    2087        5       4       5    .232    1.2       1    1.2     0   18.3
2 16 HG       23    .010   10.80     388   10.835    7620       17      14      89    .077    1.3       1    6.9    21   16.0
3 10 HG       23    .010   11.66     290   11.695   10433       22      18      86    .147    3.3       3   12.6    32   10.0
4 16 HG       23    .010   10.92     541   10.955    7620       17      14     125    .077    1.3       1    9.6    21   16.0
5 19 HG       19    .010   10.10     331   10.131    5539       11      11      60    .057     .6       1    3.4     9   19.0
6 16 HG       19    .010   10.92     570   10.951    7620       14      14     132    .077    1.1       1   10.1    21   16.0
7  3 HG       23    .120   14.35     238   14.495   16012       27     268      87    .113    3.1      30    9.9    59    3.0
8 16 HG       19    .010   10.92     619   10.951    7620       14      14     142    .077    1.1       1   10.9    21   16.0
9 C.T.        19    .010    7.30      73    7.331    1996        6       6       7    .143     .8       1     .9     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .8       2    3.6
1 IDLE        23    .010    9.88      73    9.915    2087        5       4       5    .232    1.2       1    1.2     0   18.3
2 16 HG       18    .010   10.80     599   10.829    7620       14      14     140    .077    1.1       1   10.8    21   16.0
3 10 HG       18    .010   11.53     358   11.559   10433       18      18     107    .147    2.6       3   15.8    32   10.0
4 16 HG       18    .010   10.80     644   10.829    7620       14      14     150    .077    1.1       1   11.6    21   16.0
5 19 HG       18    .010    9.99     371   10.019    5539       11      11      68    .057     .6       1    3.9     9   19.0
6 16 HG       18    .010   10.80     659   10.829    7620       14      14     154    .077    1.1       1   11.9    21   16.0
7  3 HG       20    .040   14.33     358   14.392   16012       24      90     132    .113    2.7      10   14.9    59    3.0
8 16 HG       19    .010   10.80     644   10.831    7620       14      14     150    .077    1.1       1   11.6    21   16.0
9 C.T.        19    .010    7.21      80    7.241    1996        6       6       7    .143     .8       1    1.0     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .7       1    4.5
1 IDLE        14    .010    9.77     135    9.795    2087        3       4      10    .232     .7       1    2.2     0   18.3
2 16 HG       19    .010   10.92     619   10.951    7620       14      14     142    .077    1.1       1   10.9    21   16.0
3 10 HG       19    .010   11.66     413   11.691   10433       18      18     122    .147    2.7       3   18.0    32   10.0
4 16 HG       14    .010   10.92     705   10.945    7620       11      14     163    .077     .8       1   12.5    21   16.0
5 19 HG       14    .010    9.99     399   10.015    5539        8      11      73    .057     .5       1    4.2     9   19.0
6 16 HG       14    .010   10.72     690   10.745    7620       11      14     162    .077     .8       1   12.5    21   16.0
7  3 HG       19    .170   14.33     238   14.521   16012       23     379      87    .113    2.6      43    9.8    59    3.0
8 16 HG       14    .010   11.10     674   11.125    7620       10      14     153    .077     .8       1   11.8    21   16.0
9 C.T.        14    .010    7.39      98    7.415    1996        4       5       9    .143     .6       1    1.3     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .6       3    4.5
1 IDLE        14    .010    9.77     135    9.795    2087        3       4      10    .232     .7       1    2.2     0   18.3
2 16 HG       15    .010   10.80     690   10.826    7620       11      14     161    .077     .9       1   12.4    21   16.0
3 10 HG       14    .010   11.66     441   11.685   10433       13      18     131    .147    2.0       3   19.2    32   10.0
4 16 HG       14    .010   10.68     690   10.705    7620       11      14     163    .077     .8       1   12.6    21   16.0
5 19 HG       14    .010    9.99     427   10.015    5539        8      11      78    .057     .5       1    4.5     9   19.0
6 16 HG       14    .010   10.80     690   10.826    7620       11      14     161    .077     .8       1   12.4    21   16.0
7  3 HG       19    .120   14.33     309   14.471   16012       23     268     112    .113    2.6      30   12.6    59    3.0
8 16 HG       14    .010   10.85     751   10.875    7620       11      14     175    .077     .8       1   13.5    21   16.0
9 C.T.        14    .010    7.21     110    7.235    1996        4       6      10    .143     .6       1    1.4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .5       2    4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------          .7       2    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------          .6       3    4.7
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(      .7) + 0.65(      .6) =     .608   GM/BHP HR
                                        CO- NDIR 0.35(    1.63) + 0.65(     2.5) =    2.199   GM/BHP HR
                                        NO2-NDIR 0.35(     4.0) + 0.65(     4.7) =    4.491   GM/BHP HR
                                                              CORRECTED NO2 =    4.401   GM/BHP HR
                                                                       BSFC =     .814   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE        HC-FID    CO     CO2   NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       202    .010    9.88      38    9.910    2087        4       4       3    .232    1.0       1     .6     0   18.3
2 16 HG      159    .010   10.80     350   10.826    7620       11      14      82    .077     .9       1    6.3    21   16.0
3 10 HG      133    .010   11.66     230   11.683   10433       12      18      68    .147    1.7       3   10.0    32   10.0
4 16 HG      116    .010   10.92     465   10.942    7620        8      14     108    .077     .6       1    8.3    21   16.0
5 19 HG      109    .010   10.10     275   10.121    5539        6      11      50    .057     .3       1    2.8     9   19.0
6 16 HG      116    .010   10.92     500   10.942    7620        8      14     116    .077     .6       1    8.9    21   16.0
7  3 HG      130    .120   14.35     175   14.483   16012       14     268      64    .113    1.6      30    7.3    59    3.0
8 16 HG       94    .010   10.92     520   10.939    7620        7      14     120    .077     .5       1    9.3    21   16.0
9 C.T.       102    .010    7.30      39    7.320    1996        3       6       4    .143     .4       1     .5     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .4       2    2.9
1 IDLE       202    .010    9.88      38    9.910    2087        4       4       3    .232    1.0       1     .6     0   18.3
2 16 HG      110    .010   10.80     515   10.821    7620        8      14     120    .077     .6       1    9.3    21   16.0
3 10 HG       94    .010   11.53     295   11.549   10433        8      18      88    .147    1.2       3   13.0    32   10.0
4 16 HG       82    .010   10.80     560   10.818    7620        6      14     131    .077     .4       1   10.1    21   16.0
5 19 HG       82    .010    9.99     305   10.008    5539        5      11      56    .057     .3       1    3.2     9   19.0
6 16 HG       93    .010   10.80     575   10.819    7620        7      14     134    .077     .5       1   10.4    21   16.0
7  3 HG      102    .040   14.33     275   14.380   16012       11      90     102    .113    1.3      10   11.5    59    3.0
8 16 HG       77    .010   10.80     530   10.818    7620        5      14     124    .077     .4       1    9.5    21   16.0
9 C.T.        84    .010    7.21      37    7.228    1996        2       6       3    .143     .3       1     .5     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .3       1    3.7
1 IDLE        60    .010    9.77      50    9.786    2087        1       4       4    .232     .3       1     .8     0   18.3
2 16 HG       89    .010   10.92     510   10.939    7620        6      14     118    .077     .5       1    9.1    21   16.0
3 10 HG       83    .010   11.66     320   11.678   10433        7      18      95    .147    1.1       3   14.0    32   10.0
4 16 HG       77    .010   10.92     585   10.938    7620        5      14     135    .077     .4       1   10.4    21   16.0
5 19 HG       71    .010    9.99     310   10.007    5539        4      11      57    .057     .2       1    3.2     9   19.0
6 16 HG       82    .010   10.72     590   10.738    7620        6      14     139    .077     .5       1   10.7    21   16.0
7  3 HG       96    .170   14.33     145   14.510   16012       11     379      53    .113    1.2      43    6.0    59    3.0
8 16 HG       66    .010   11.10     560   11.117    7620        5      14     127    .077     .3       1    9.8    21   16.0
9 C.T.        75    .010    7.39      38    7.407    1996        2       5       3    .143     .3       1     .5     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .3       3    3.5
1 IDLE        60    .010    9.77      50    9.786    2087        1       4       4    .232     .3       1     .8     0   18.3
2 16 HG       77    .010   10.80     570   10.818    7620        5      14     133    .077     .4       1   10.3    21   16.0
3 10 HG       78    .010   11.66     325   11.678   10433        7      18      96    .147    1.0       3   14.2    32   10.0
4 16 HG       71    .010   10.68     565   10.697    7620        5      14     134    .077     .4       1   10.3    21   16.0
5 19 HG       66    .010    9.99     310   10.007    5539        4      11      57    .057     .2       1    3.2     9   19.0
6 16 HG       77    .010   10.80     570   10.818    7620        5      14     133    .077     .4       1   10.3    21   16.0
7  3 HG       91    .120   14.33     185   14.459   16012       10     268      68    .113    1.1      30    7.7    59    3.0
8 16 HG       61    .010   10.85     595   10.866    7620        4      14     139    .077     .3       1   10.7    21   16.0
9 C.T.        69    .010    7.21      40    7.227    1996        2       6       4    .143     .3       1     .5     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------          .2       2    3.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------          .4       2    3.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------          .3       3    3.6
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      .4) + 0.65(      .3) =     .296   GM/BHP HR
                                        CO- NDIR 0.35(     1.6) + 0.65(     2.5) =    2.196   GM/BHP HR
                                        NO2-CL   0.35(     3.3) + 0.65(     3.6) =    3.509   GM/BHP HR
                                                              CORRECTED NO2 =    3.438   GM/BHP HR
                                                                       BSFC =     .814   LB/BHP HR
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TABLE E-12. MASS EMISSIONS BY NINE-MODE FTP

ENGINE S-1   TEST 24   RUN-2   EGR-AIR-CAT   05-29-73   K = .978   HUM = 68.7 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	14	.010	9.82	48	9.845	2087	3	4	3	.232	.7	1	.8	0	18.3
2 16 HG	18	.010	10.86	440	10.889	7620	14	14	102	.077	1.0	1	7.9	21	16.0
3 10 HG	15	.010	11.79	371	11.816	10433	14	18	109	.147	2.1	3	16.0	32	10.0
4 16 HG	15	.010	11.04	584	11.066	7620	11	14	134	.077	.9	1	10.3	21	16.0
5 19 HG	15	.010	9.99	250	10.016	5534	9	11	46	.057	.5	1	2.6	9	19.0
6 16 HG	18	.010	11.22	644	11.249	7620	13	14	145	.077	1.0	1	11.2	21	16.0
7 3 HG	18	.150	14.65	198	14.819	16012	21	327	71	.113	2.4	37	8.0	59	3.0
8 16 HG	13	.010	10.86	584	10.884	7620	10	14	136	.077	.8	1	10.5	21	16.0
9 C.T.	13	.010	7.30	48	7.324	1996	4	6	4	.143	.5	1	.6	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.5	3	3.7		
1 IDLE	14	.010	9.82	48	9.845	2087	3	4	3	.232	.7	1	.8	0	18.3
2 16 HG	16	.010	10.98	614	11.007	7620	12	14	141	.077	.9	1	10.9	21	16.0
3 10 HG	16	.010	11.79	380	11.817	10433	15	18	111	.147	2.2	3	16.4	32	10.0
4 16 HG	17	.010	10.80	659	10.828	7620	13	14	154	.077	1.0	1	11.9	21	16.0
5 19 HG	16	.010	9.77	224	9.797	5534	10	11	42	.057	.6	1	2.4	9	19.0
6 16 HG	18	.010	11.22	700	11.249	7620	13	14	157	.077	1.0	1	12.1	21	16.0
7 3 HG	18	.080	14.56	250	14.659	16012	21	177	91	.113	2.4	20	10.2	59	3.0
8 16 HG	18	.010	11.16	674	11.189	7620	13	14	152	.077	1.0	1	11.7	21	16.0
9 C.T.	16	.010	7.40	52	7.427	1996	5	5	5	.143	.7	1	.7	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.6	2	4.2		
1 IDLE	13	.010	9.77	72	9.794	2087	3	4	5	.232	.7	1	1.2	0	18.3
2 16 HG	13	.010	11.16	659	11.184	7620	10	14	149	.077	.7	1	11.5	21	16.0
3 10 HG	16	.010	12.05	371	12.077	10433	15	17	106	.147	2.2	3	15.6	32	10.0
4 16 HG	18	.010	11.04	644	11.069	7620	13	14	147	.077	1.0	1	11.3	21	16.0
5 19 HG	16	.010	9.82	237	9.847	5534	10	11	44	.057	.6	1	2.5	9	19.0
6 16 HG	17	.100	11.04	705	11.158	7620	13	138	160	.077	1.0	11	12.3	21	16.0
7 3 HG	18	.140	14.56	198	14.719	16012	21	308	72	.113	2.4	35	8.1	59	3.0
8 16 HG	17	.010	10.98	629	11.008	7620	13	14	145	.077	1.0	1	11.1	21	16.0
9 C.T.	13	.010	7.48	48	7.504	1996	4	5	4	.143	.5	1	.6	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.5	3	4.0		
1 IDLE	13	.010	9.77	72	9.794	2087	3	4	5	.232	.7	1	1.2	0	18.3
2 16 HG	16	.010	11.04	659	11.067	7620	12	14	151	.077	.9	1	11.6	21	16.0
3 10 HG	16	.010	12.05	385	12.077	10433	15	17	110	.147	2.2	3	16.2	32	10.0
4 16 HG	16	.010	10.74	605	10.767	7620	12	14	142	.077	.9	1	10.9	21	16.0
5 19 HG	13	.010	9.82	263	9.844	5534	8	11	49	.057	.4	1	2.8	9	19.0
6 16 HG	16	.010	10.98	689	11.007	7620	12	14	158	.077	.9	1	12.2	21	16.0
7 3 HG	18	.150	14.49	211	14.659	16012	21	331	77	.113	2.4	37	8.6	59	3.0
8 16 HG	16	.010	11.22	644	11.247	7620	12	14	145	.077	.9	1	11.2	21	16.0
9 C.T.	13	.010	7.44	48	7.464	1996	4	5	4	.143	.5	1	.6	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.5	3	4.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.6	2	3.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.5	3	4.1		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(.6) + 0.65(.5) = .550 GM/BHP HR
CO- NDIR 0.35(2.1) + 0.65(2.7) = 2.496 GM/BHP HR
NO2-NDIR 0.35(3.9) + 0.65(4.1) = 4.031 GM/BHP HR
CORRECTED NO2 = 3.944 GM/BHP HR
BSFC = .814 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	93	.010	9.82	47	9.839	2087	2	4	3	.232	.5	1	.8	0	18.3
2 16 HG	99	.010	10.86	465	10.880	7620	7	14	108	.077	.5	1	8.3	21	16.0
3 10 HG	85	.010	11.79	353	11.809	10433	8	18	104	.147	1.1	3	15.2	32	10.0
4 16 HG	75	.010	11.04	568	11.057	7620	5	14	130	.077	.4	1	10.0	21	16.0
5 19 HG	66	.010	9.99	227	10.007	5534	4	11	42	.057	.2	1	2.4	9	19.0
6 16 HG	87	.010	11.22	638	11.239	7620	6	14	144	.077	.5	1	11.1	21	16.0
7 3 HG	97	.150	14.65	170	14.810	16012	10	328	61	.113	1.2	37	6.9	59	3.0
8 16 HG	66	.010	10.86	558	10.877	7620	5	14	130	.077	.4	1	10.0	21	16.0
9 C.T.	75	.010	7.30	45	7.317	1996	2	6	4	.143	.3	1	.6	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.3	3	3.6		
1 IDLE	93	.010	9.82	47	9.839	2087	2	4	3	.232	.5	1	.8	0	18.3
2 16 HG	77	.010	10.98	583	10.998	7620	5	14	134	.077	.4	1	10.3	21	16.0
3 10 HG	78	.010	11.79	365	11.808	10433	7	18	107	.147	1.0	3	15.7	32	10.0
4 16 HG	66	.010	10.80	650	10.817	7620	5	14	152	.077	.4	1	11.7	21	16.0
5 19 HG	63	.010	9.77	200	9.786	5534	4	11	38	.057	.2	1	2.1	9	19.0
6 16 HG	83	.010	11.22	690	11.238	7620	6	14	155	.077	.4	1	12.0	21	16.0
7 3 HG	83	.080	14.56	220	14.648	16012	9	177	80	.113	1.0	20	9.0	59	3.0
8 16 HG	57	.010	11.16	635	11.176	7620	4	14	144	.077	.3	1	11.1	21	16.0
9 C.T.	72	.010	7.40	55	7.417	1996	2	5	5	.143	.3	1	.7	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.2	2	4.0		
1 IDLE	55	.010	9.77	55	9.785	2087	1	4	4	.232	.3	1	.9	0	18.3
2 16 HG	77	.010	11.16	645	11.178	7620	5	14	146	.077	.4	1	11.2	21	16.0
3 10 HG	72	.010	12.05	350	12.067	10433	6	17	100	.147	.9	3	14.8	32	10.0
4 16 HG	66	.010	11.04	634	11.057	7620	5	14	145	.077	.4	1	11.2	21	16.0
5 19 HG	58	.010	9.82	213	9.836	5534	3	11	40	.057	.2	1	2.3	9	19.0
6 16 HG	77	.100	11.09	693	11.198	7620	5	138	157	.077	.4	11	12.1	21	16.0
7 3 HG	80	.140	14.56	170	14.708	16012	9	308	61	.113	1.0	35	6.9	59	3.0
8 16 HG	55	.010	10.98	597	10.996	7620	4	14	137	.077	.3	1	10.6	21	16.0
9 C.T.	64	.010	7.48	50	7.496	1996	2	5	4	.143	.2	1	.6	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.2	3	3.8		
1 IDLE	55	.010	9.77	55	9.785	2087	1	4	4	.232	.3	1	.9	0	18.3
2 16 HG	72	.010	11.04	640	11.057	7620	5	14	146	.077	.4	1	11.2	21	16.0
3 10 HG	72	.010	12.05	367	12.067	10433	6	17	105	.147	.9	3	15.5	32	10.0
4 16 HG	58	.010	10.74	587	10.756	7620	4	14	138	.077	.3	1	10.6	21	16.0
5 19 HG	60	.010	9.82	247	9.836	5534	3	11	46	.057	.2	1	2.6	9	19.0
6 16 HG	72	.010	10.98	685	10.997	7620	5	14	158	.077	.4	1	12.1	21	16.0
7 3 HG	74	.150	14.49	170	14.648	16012	9	331	62	.113	1.0	37	7.0	59	3.0
8 16 HG	55	.010	11.22	620	11.236	7620	4	14	140	.077	.3	1	10.7	21	16.0
9 C.T.	62	.010	7.44	52	7.456	1996	2	5	5	.143	.2	1	.7	0	29.0
CYCLE COMPOSITE IN GM/BHP HR											.2	3	3.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.3	2	3.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.2	3	3.9		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(.3) + 0.65(.2) = .232 GM/BHP HR
CO- NDIR 0.35(2.1) + 0.65(2.7) = 2.498 GM/BHP HR
NO2-CL 0.35(3.8) + 0.65(3.9) = 3.838 GM/BHP HR
CORRECTED NO2 = 3.755 GM/BHP HR
BSFC = .814 LB/BHP HR

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                              TABLE E-13. MASS EMISSIONS BY NINE-MODE FTP
ENGINE S-1   TEST 24  RUN-3   EGR-AIR-CAT              05-24-73      K = .943      HUM = 59.1  GR/LB
--------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE           HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.   HC          CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         20    .010    9.82     60    9.852     2087      5       4       4    .232   1.1          1     1.0    0    18.3
2 16 MG        28    .010   11.04    540   11.080     7620     21      14     123    .077   1.6          1     9.5   21    16.0
3 10 MG        28    .010   12.05    385   12.090    10933     26      17     110    .147   3.8          3    16.2   32    10.0
4 16 MG        28    .010   10.92    599   10.960     7620     21      14     138    .077   1.6          1    10.6   21    16.0
5 19 MG        28    .010   10.10    330   10.140     5539     17      11      60    .057    .9          1     3.4    9    19.0
6 16 MG        28    .010   10.75    621   10.790     7620     21      14     146    .077   1.6          1    11.2   21    16.0
7  3 MG        30    .230   14.49    148   14.752    16012     35     504      53    .113   4.0         57     6.0   59     3.0
8 16 MG        28    .010   11.04    621   11.080     7620     21      14     142    .077   1.6          1    10.9   21    16.0
9 C.T.         28    .010    7.30     72    7.340     1996      8       5       7    .143   1.2          1      .9    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.0          4     3.8
1 IDLE         20    .010    9.82     60    9.852     2087      5       4       4    .232   1.1          1     1.0    0    18.3
2 16 MG        30    .010   10.86    659   10.902     7620     23      14     153    .077   1.7          1    11.8   21    16.0
3 10 MG        33    .010   11.72    399   11.766    10933     32      18     117    .147   4.6          3    17.3   32    10.0
4 16 MG        33    .010   10.92    659   10.966     7620     25      14     152    .077   1.9          1    11.7   21    16.0
5 19 MG        33    .010    9.82    211    9.866     5539     20      11      39    .057   1.1          1     2.2    9    19.0
6 16 MG        35    .010   11.04    705   11.088     7620     26      14     161    .077   2.0          1    12.4   21    16.0
7  3 MG        36    .030   14.30    371   14.369    16012     43      68     137    .113   4.9          8    15.5   59     3.0
8 16 MG        33    .010   11.28    674   11.326     7620     24      14     151    .077   1.8          1    11.6   21    16.0
9 C.T.         33    .010    7.33     61    7.376     1996     10       5       5    .143   1.4          1      .8    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.1          1     4.6
1 IDLE         44    .010    9.66     59    9.712     2087      9       4       4    .232   2.1          1      .9    0    18.3
2 16 MG        37    .010   11.04    674   11.090     7620     27      14     154    .077   2.1          1    11.8   21    16.0
3 10 MG        37    .010   11.79    385   11.840    10933     35      18     113    .147   5.2          3    16.6   32    10.0
4 16 MG        38    .010   10.80    644   10.851     7620     29      14     150    .077   2.2          1    11.6   21    16.0
5 19 MG        37    .010   10.05    303   10.100     5539     22      11      55    .057   1.2          1     3.1    9    19.0
6 16 MG        38    .010   10.86    659   10.911     7620     29      14     153    .077   2.2          1    11.8   21    16.0
7  3 MG        41    .060   14.33    290   14.434    16012     49     134     107    .113   5.6         15    12.1   59     3.0
8 16 MG        38    .010   10.80    659   10.851     7620     29      14     154    .077   2.2          1    11.8   21    16.0
9 C.T.         40    .010    7.28     60    7.333     1996     12       5       5    .143   1.7          1      .8    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.3          1     4.4
1 IDLE         39    .010    9.66     59    9.712     2087      9       4       4    .232   2.1          1      .9    0    18.3
2 16 MG        41    .010   10.80    640   10.849     7620     31      14     149    .077   2.4          1    11.5   21    16.0
3 10 MG        41    .010   11.79    385   11.844    10933     39      18     113    .147   5.7          3    16.6   32    10.0
4 16 MG        44    .010   10.80    674   10.858     7620     33      14     157    .077   2.6          1    12.1   21    16.0
5 19 MG        41    .010    9.88    330    9.934     5539     28      11      61    .057   1.4          1     3.5    9    19.0
6 16 MG        44    .010   10.80    751   10.858     7620     33      14     175    .077   2.6          1    13.5   21    16.0
7  3 MG        44    .040   14.33    317   14.418    16012     53      90     117    .113   6.0         10    13.2   59     3.0
8 16 MG        41    .010   10.92    681   10.974     7620     31      14     157    .077   2.4          1    12.1   21    16.0
9 C.T.         39    .010    7.23     63    7.282     1996     12       6       6    .143   1.7          1      .8    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.3          1     4.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------   1.0          2     4.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------   1.4          1     4.5
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(      1.0) + 0.65(      1.4) =    1.271   GM/BHP HR
                                        CO- NDIR 0.35(      2.3) + 0.65(      1.2) =    1.575   GM/BHP HR
                                        NO2-NDIR 0.35(      4.2) + 0.65(      4.5) =    4.383   GM/BHP HR
                                                              CORRECTED NO2 =    4.132   GM/BHP HR
                                                                       BSFC =     .814   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.   HC-FID      CO  NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         76    .010    9.82     50    9.838     2087      2       4       4    .232     .4          1      .8    0    18.3
2 16 MG        88    .010   11.04    570   11.059     7620      6      14     130    .077     .5          1    10.0   21    16.0
3 10 MG        74    .010   12.05    370   12.067    10933      6      17     106    .147     .9          3    15.6   32    10.0
4 16 MG        66    .010   10.92    640   10.937     7620      5      14     148    .077     .4          1    11.4   21    16.0
5 19 MG        60    .010   10.10    315   10.116     5539      3      11      57    .057     .2          1     3.3    9    19.0
6 16 MG        66    .010   10.75    620   10.767     7620      5      14     146    .077     .4          1    11.2   21    16.0
7  3 MG        85    .230   14.49    120   14.729    16012      9     505      43    .113    1.0         57     4.9   59     3.0
8 16 MG        66    .010   11.04    595   11.057     7620      5      14     136    .077     .4          1    10.5   21    16.0
9 C.T.         69    .010    7.30     30    7.317     1996      2       6       3    .143     .3          1      .4    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .2          4     3.7
1 IDLE         76    .010    9.82     50    9.838     2087      2       4       4    .232     .4          1      .8    0    18.3
2 16 MG        72    .010   10.86    645   10.877     7620      5      14     150    .077     .4          1    11.6   21    16.0
3 10 MG        72    .010   11.72    380   11.737    10933      6      18     112    .147     .9          3    16.5   32    10.0
4 16 MG        66    .010   10.92    645   10.937     7620      5      14     149    .077     .4          1    11.5   21    16.0
5 19 MG        60    .010    9.82    200    9.836     5539      3      11      37    .057     .2          1     2.1    9    19.0
6 16 MG        72    .010   11.04    715   11.057     7620      5      14     164    .077     .4          1    12.6   21    16.0
7  3 MG        74    .030   14.30    349   14.337    16012      8      68     128    .113     .9          8    14.4   59     3.0
8 16 MG        56    .010   11.28    650   11.296     7620      4      14     146    .077     .3          1    11.2   21    16.0
9 C.T.         69    .010    7.33     30    7.347     1996      2       5       3    .143     .3          1      .4    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .2          1     4.4
1 IDLE         49    .010    9.66     55    9.675     2087      1       4       4    .232     .2          1      .9    0    18.3
2 16 MG        69    .010   11.04    655   11.057     7620      5      14     150    .077     .4          1    11.5   21    16.0
3 10 MG        67    .010   11.79    380   11.807    10933      6      18     111    .147     .9          3    16.4   32    10.0
4 16 MG        60    .010   10.80    630   10.816     7620      4      14     147    .077     .3          1    11.3   21    16.0
5 19 MG        57    .010   10.05    288   10.066     5539      3      11      53    .057     .2          1     3.0    9    19.0
6 16 MG        66    .010   10.86    675   10.877     7620      5      14     157    .077     .4          1    12.1   21    16.0
7  3 MG        74    .060   14.33    275   14.397    16012      8     135     102    .113     .9         15    11.5   59     3.0
8 16 MG        55    .010   10.80    640   10.815     7620      4      14     150    .077     .3          1    11.5   21    16.0
9 C.T.         64    .010    7.28     60    7.296     1996      2       6       5    .143     .3          1      .8    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .2          1     4.3
1 IDLE         49    .010    9.66     55    9.675     2087      1       4       4    .232     .2          1      .9    0    18.3
2 16 MG        66    .010   10.80    630   10.817     7620      5      14     147    .077     .4          1    11.3   21    16.0
3 10 MG        67    .010   11.79    380   11.807    10933      6      18     111    .147     .9          3    16.4   32    10.0
4 16 MG        60    .010   10.80    660   10.816     7620      4      14     154    .077     .3          1    11.9   21    16.0
5 19 MG        55    .010    9.88    318    9.895     5539      3      11      59    .057     .2          1     3.4    9    19.0
6 16 MG        66    .010   10.80    740   10.817     7620      5      14     173    .077     .4          1    13.3   21    16.0
7  3 MG        68    .040   14.33    290   14.377    16012      8      90     107    .113     .9         10    12.1   59     3.0
8 16 MG        55    .010   10.92    665   10.936     7620      4      14     154    .077     .3          1    11.8   21    16.0
9 C.T.         67    .010    7.23     30    7.247     1996      2       6       3    .143     .3          1      .4    0    24.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .2          1     4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     .2          2     4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     .2          1     4.4
FOUR CYCLE COMPOSITE =                  HC- FID  0.35(       .2) + 0.65(       .2) =     .214   GM/BHP HR
                                        CO- NDIR 0.35(      2.3) + 0.65(      1.2) =    1.579   GM/BHP HR
                                        NO2-CL   0.35(      4.1) + 0.65(      4.4) =    4.267   GM/BHP HR
                                                              CORRECTED NO2 =    4.024   GM/BHP HR
                                                                       BSFC =     .814   LB/BHP HR
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                       TABLE E-14. MASS EMISSIONS BY NINE-MODE FTP
ENGINE S-2   TEST-30  RUN-1     S-2 W/O CATALYST      06-08-73      K = .996      HUM = 74.0  GR/LB
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MODE          CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
              HC     CO     CO2      NO     CARBON   CONS.     HC     CO     NO2     FACT.    HC      CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        60    .620    7.21     48     7.895    1996      16     317      4     .232     3.8     73      .9     0    18.5
2 16 HG       70    .290   10.10    385    10.466    7666      55     429     94     .077     4.3     33     7.2    20    16.0
3 10 HG       56    .560   11.28    277    11.900   10619      54    1009     82     .147     7.9    148    12.1    34    10.0
4 16 HG       51    .370   10.33    426    10.755    7666      39     533    101     .077     3.0     41     7.8    20    16.0
5 19 HG       41    .240    9.66    357     9.944    6033      27     294     72     .057     1.5     17     4.1    10    19.0
6 16 HG       51    .430   10.44    469    10.925    7666      39     609    109     .077     3.0     47     8.4    20    16.0
7  3 HG       56   2.370   12.18    344    14.610   17373      72    5693    136     .113     8.1    643    15.4    61     3.0
8 16 HG       41    .340   10.56    511    10.944    7666      31     481    119     .077     2.4     37     9.2    20    16.0
9 C.T.      1852    .120    3.21     36     5.330    1905     715      87      4     .143   102.2     12      .6     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   7.3     56     3.5
1 IDLE        60    .620    7.21     48     7.895    1996      16     317      4     .232     3.8     73      .9     0    18.5
2 16 HG       70    .300   10.21    469    10.586    7666      55     439    113     .077     4.2     34     8.7    20    16.0
3 10 HG       46    .610   11.53    290    12.190   10619      43    1073     84     .147     6.4    158    12.3    34    10.0
4 16 HG       46    .290   10.33    526    10.670    7666      36     421    125     .077     2.7     32     9.7    20    16.0
5 19 HG       41    .210    9.66    371     9.914    6033      27     258     75     .057     1.5     15     4.3    10    19.0
6 16 HG       51    .290   10.33    540    10.675    7666      40     421    129     .077     3.0     32     9.9    20    16.0
7  3 HG       56   2.210   12.31    344    14.580   17373      72    5319    136     .113     8.1    601    15.4    61     3.0
8 16 HG       41    .270   10.44    540    10.754    7666      32     389    128     .077     2.4     30     9.8    20    16.0
9 C.T.      1769    .110    3.16     36     5.181    1905     703      82      4     .143   100.5     12      .6     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   7.1     53     3.8
1 IDLE        56    .480    7.62     66     8.160    1996      15     237      5     .232     3.4     55     1.2     0    18.5
2 16 HG       61    .310   10.17    526    10.546    7666      48     455    127     .077     3.7     35     9.8    20    16.0
3 10 HG       46    .610   11.53    303    12.190   10619      43    1073     88     .147     6.4    158    12.9    34    10.0
4 16 HG       46    .330   10.33    526    10.710    7666      36     477    125     .077     2.7     37     9.6    20    16.0
5 19 HG       39    .260    9.77    310    10.072    6033      25     315     62     .057     1.4     18     3.5    10    19.0
6 16 HG       48    .370   10.44    555    10.862    7666      37     527    130     .077     2.8     41    10.0    20    16.0
7  3 HG       51   2.090   12.31    357    14.455   17373      66    5074    142     .113     7.5    573    16.1    61     3.0
8 16 HG       51    .310   10.50    555    10.865    7666      39     442    130     .077     3.0     34    10.0    20    16.0
9 C.T.      1480    .340    3.56     52     5.498    1905     554     238      6     .143    79.2     34      .9     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   5.9     53     4.0
1 IDLE        56    .480    7.62     66     8.160    1996      15     237      5     .232     3.4     55     1.2     0    18.5
2 16 HG       65    .320   10.21    526    10.600    7666      51     467    126     .077     3.9     36     9.7    20    16.0
3 10 HG       46    .740   11.58    277    12.370   10619      43    1283     79     .147     6.3    189    11.6    34    10.0
4 16 HG       46    .350   10.38    497    10.780    7666      35     503    117     .077     2.7     39     9.0    20    16.0
5 19 HG       41    .300    9.82    357    10.164    6033      26     360     70     .057     1.5     21     4.0    10    19.0
6 16 HG       48    .370   10.44    569    10.862    7666      37     527    133     .077     2.8     41    10.2    20    16.0
7  3 HG       48   2.130   12.38    378    14.562   17373      62    5133    150     .113     7.0    580    16.9    61     3.0
8 16 HG       41    .280   10.38    589    10.704    7666      32     405    139     .077     2.4     31    10.7    20    16.0
9 C.T.      1460    .130    3.50     58     5.207    1905     577      96      7     .143    82.5     14     1.0     0    29.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   6.0     54     4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------   7.2     55     3.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------   6.0     53     4.0
FOUR CYCLE COMPOSITE -
                                   HC= NDIR 0.35(     7.2) + 0.65(     6.0) =    6.386   GM/BHP HR
                                   CO= NDIR 0.35(    54.5) + 0.65(    53.2) =   53.634   GM/BHP HR
                                   NO2=NDIR 0.35(     3.7) + 0.65(     4.0) =    3.869   GM/BHP HR
                                                        CORRECTED NO2 =    3.850   GM/BHP HR
                                                                 BSFC =     .821   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
            HC-FID   CO     CO2    NO-CL    CARBON   CONS.     HC     CO     NO2     FACT.  HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       858    .620    7.21     30     7.916    1996      22     316      3     .232     5.0     73      .6     0    18.5
2 16 HG     1030    .290   10.10    363    10.493    7666      75     428     88     .077     5.8     33     6.8    20    16.0
3 10 HG      888    .560   11.28    263    11.929   10619      79    1007     78     .147    11.6    148    11.4    34    10.0
4 16 HG      703    .370   10.33    400    10.770    7666      50     532     95     .077     3.9     41     7.3    20    16.0
5 19 HG      437    .240    9.66    338     9.944    6033      26     294     68     .057     1.5     17     3.9    10    19.0
6 16 HG      792    .430   10.44    450    10.949    7666      55     608    105     .077     4.3     47     8.1    20    16.0
7  3 HG      953   2.370   12.18    300    14.645   17373     113    5679    118     .113    12.8    642    13.4    61     3.0
8 16 HG      528    .340   10.56    475    10.953    7666      37     481    110     .077     2.8     37     8.5    20    16.0
9 C.T.     19791    .120    3.21     25     5.309    1905     710      87      3     .143   101.6     12      .4     0    29.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   8.0     56     3.2
1 IDLE       858    .620    7.21     30     7.916    1996      22     316      3     .232     5.0     73      .6     0    18.5
2 16 HG      922    .300   10.21    463    10.602    7666      67     438    111     .077     5.1     34     8.6    20    16.0
3 10 HG      756    .610   11.53    288    12.216   10619      66    1071     83     .147     9.7    157    12.2    34    10.0
4 16 HG      703    .290   10.33    513    10.690    7666      50     420    122     .077     3.9     32     9.4    20    16.0
5 19 HG      437    .210    9.66    375     9.914    6033      27     258     76     .057     1.5     15     4.3    10    19.0
6 16 HG      747    .290   10.33    513    10.695    7666      54     420    122     .077     4.1     32     9.4    20    16.0
7  3 HG      771   2.210   12.31    313    14.597   17373      92    5313    124     .113    10.4    600    14.0    61     3.0
8 16 HG      528    .270   10.44    538    10.763    7666      38     388    127     .077     2.9     30     9.8    20    16.0
9 C.T.     21429    .110    3.16     28     5.413    1905     754      78      3     .143   107.8     11      .5     0    29.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   8.0     53     3.7
1 IDLE       774    .480    7.62     50     8.177    1996      19     237      4     .232     4.4     55      .9     0    18.5
2 16 HG      899    .310   10.17    500    10.570    7666      65     454    120     .077     5.0     35     9.2    20    16.0
3 10 HG      712    .610   11.53    300    12.211   10619      62    1071     87     .147     9.1    157    12.7    34    10.0
4 16 HG      659    .330   10.33    500    10.726    7666      47     476    119     .077     3.6     37     9.1    20    16.0
5 19 HG      415    .260    9.77    300    10.072    6033      25     315     60     .057     1.4     18     3.4    10    19.0
6 16 HG      748    .370   10.44    525    10.885    7666      53     526    123     .077     4.1     41     9.5    20    16.0
7  3 HG      771   2.090   12.31    336    14.477   17373      92    5066    135     .113    10.4    572    15.2    61     3.0
8 16 HG      484    .310   10.50    538    10.858    7666      34     442    126     .077     2.6     34     9.7    20    16.0
9 C.T.     21550    .340    3.56     28     6.055    1905     678     216      3     .143    97.0     31      .4     0    29.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   7.4     52     3.8
1 IDLE       774    .480    7.62     50     8.177    1996      19     237      4     .232     4.4     55      .9     0    18.5
2 16 HG      966    .320   10.21    500    10.627    7666      70     466    120     .077     5.4     36     9.2    20    16.0
3 10 HG      713    .740   11.58    275    12.391   10619      61    1280     78     .147     9.0    188    11.5    34    10.0
4 16 HG      616    .350   10.38    475    10.792    7666      44     502    112     .077     3.4     39     8.6    20    16.0
5 19 HG      437    .300    9.82    380    10.164    6033      26     360     69     .057     1.5     21     3.9    10    19.0
6 16 HG      748    .370   10.44    550    10.885    7666      53     526    129     .077     4.1     41     9.9    20    16.0
7  3 HG      771   2.130   12.38    350    14.587   17373      92    5124    138     .113    10.4    579    15.6    61     3.0
8 16 HG      483    .280   10.38    563    10.708    7666      35     405    134     .077     2.7     31    10.3    20    16.0
9 C.T.     21498    .130    3.50     30     5.780    1905     709      87      3     .143   101.3     12      .5     0    29.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   7.6     54     3.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------   8.0     54     3.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------   7.5     53     3.8
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(     8.0) + 0.65(     7.5) =    7.662   GM/BHP HR
                                  CO- NDIR 0.35(    54.4) + 0.65(    53.0) =   53.462   GM/BHP HR
                                  NO2-CL   0.35(     3.4) + 0.65(     3.8) =    3.653   GM/BHP HR
                                                       CORRECTED NO2 =    3.639   GM/BHP HR
                                                                BSFC =     .821   LB/BHP HR
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                         TABLE E-15. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 5-U   TEST-28  RUN-1   1972 STANDARD          06-07-73        K =1.020       HUM = 81.6  GR/LB
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                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE             HC       CO     CO2     NO   CARBON   CONS.     HC      CO     NO2   FACT.    HC       CO    NO2    HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE           179   2.990    8.62     98   11.303   2091      35     908      3   .232     8.1     211     .7     0    18.7
2 30 PCT T       160    .790   13.19   1695   19.053   8573     105     912    333   .077     8.1      70   25.7    26    15.9
3 60 PCT T       160   1.330   13.93   1871   19.933  13295     153    2383    551   .197    22.5     350   81.0    52     9.8
4 30 PCT T       150   1.210   13.19   1389   19.512   8573      96    1999    272   .077     7.9     111   21.0    26    15.9
5 10 PCT T       122   1.080   13.19    585   19.352   5625      52     855     76   .057     2.9      49    9.3     9    19.5
6 30 PCT T       195   1.330   13.19   1351   19.627   8573      92    1575    263   .077     7.1     181   20.2    26    15.9
7 90 PCT T       179   5.210   11.53    570   16.928  21910     238   13311    239   .113    26.9    1504   27.0    78     2.9
8 30 PCT T       195   1.990   13.19   1351   19.787   8573      91    1745    260   .077     7.0     134   20.0    26    15.9
9 C.T.          2696   1.990    9.79     65    9.138   1996     629     657      5   .193    89.3      94     .7     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     7.2     106    8.0
1 IDLE           179   2.990    8.62     98   11.303   2091      35     908      3   .232     8.1     211     .7     0    18.7
2 30 PCT T       150   1.050   13.19   1529   19.352   8573      97    1267    302   .077     7.5      98   23.3    26    15.9
3 60 PCT T       150   1.570   13.29   1749   15.022  13295     193    2796    512   .197    21.0     911   75.3    52     9.8
4 30 PCT T       136   1.330   13.29   1927   19.767   8573      85    1560    275   .077     6.6     120   21.2    26    15.9
5 10 PCT T       112   1.330   13.19    555   19.591   5625      97    1036     71   .057     2.7      59    4.0     9    19.5
6 30 PCT T       191   1.930   13.19   1599   19.722   8573      89    1608    298   .077     6.8     130   23.0    26    15.9
7 90 PCT T       169   5.630   11.28    969   17.093  21910     229   14295    195   .113    25.8    1610   22.0    78     2.9
8 30 PCT T       191   1.600   13.19   1389   19.892   8573      88    1861    266   .077     6.8     143   20.9    26    15.9
9 C.T.          2735   1.790    9.65     66    9.399   1996     628     768      5   .193    89.8     110     .7     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     7.0     116    7.6
1 IDLE           150   2.530    9.23     36   11.922   2091      28     875      2   .232     6.9     203     .5     0    18.7
2 30 PCT T       150   1.160   13.19   1505   19.962   8573      96    1389    296   .077     7.4     107   22.8    26    15.9
3 60 PCT T       150   1.990   13.19   1687   15.292  13295     191    3905    487   .197    20.7     501   71.5    52     9.8
4 30 PCT T       131   1.130   13.29   1589   19.561   8573      83    1399    310   .077     6.9     103   23.8    26    15.9
5 10 PCT T       112   1.180   13.29    599   19.591   5625      97     919     77   .057     2.7      52    4.4     9    19.5
6 30 PCT T       136   1.180   13.29   1625   19.617   8573      86    1398    316   .077     6.6     108   24.4    26    15.9
7 90 PCT T       169   4.920   11.66    659   16.787  21910     226   12698    280   .113    25.6    1435   31.6    78     2.9
8 30 PCT T       136   1.270   13.29   1645   19.707   8573      86    1495    318   .077     6.6     115   24.5    26    15.9
9 C.T.          2735   1.940    5.07     63    9.969   1996     592     785      4   .193    89.6     112     .6     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     6.7     110    8.2
1 IDLE           150   2.530    9.23     36   11.922   2091      28     875      2   .232     6.9     203     .5     0    18.7
2 30 PCT T       150   1.160   13.19   1529   19.962   8573      96    1389    300   .077     7.4     107   23.1    26    15.9
3 60 PCT T       195   1.860   13.29   1749   15.307  13295     136    3251    502   .197    19.9     478   73.9    52     9.8
4 30 PCT T       131   1.270   13.19   1589   19.551   8573      83    1511    310   .077     6.4     116   23.9    26    15.9
5 10 PCT T        98   1.080   13.29    969   19.976   5625      91     848     61   .057     2.3      48    3.4     9    19.5
6 30 PCT T       127   1.160   13.29   1666   19.587   8573      81    1377    325   .077     6.2     106   25.0    26    15.9
7 90 PCT T       160   4.920   11.53    629   16.623  21910     223   12801    269   .113    25.1    1496   30.4    78     2.9
8 30 PCT T       131   1.960   13.19   1599   19.791   8573      88    1715    298   .077     6.3     132   23.0    26    15.9
9 C.T.          2696   1.860    9.79     61    9.508   1996     600     789      4   .193    85.8     113     .6     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     6.7     110    8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     7.1     111    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     6.7     110    8.2
FOUR CYCLE COMPOSITE =
                                  HC- NDIR 0.35(     7.1) + 0.65(     6.7) =     6.826   GM/BHP HR
                                  CO- NDIR 0.35(   111.0) + 0.65(   110.0) =   110.354   GM/BHP HR
                                  NO2-NDIR 0.35(     7.8) + 0.65(     8.2) =     8.061   GM/BHP HR
                                                       CORRECTED NO2 =     8.219   GM/BHP HR
                                                                BSFC =      .715   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
MODE           HC-FID     CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID     CO   NO2-CL  HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          2470   2.990    8.62     50   11.357   2091      99     909      3   .232    10.3     210     .7     0    18.7
2 30 PCT T      2392    .790   13.19   1700   19.119   8573     145     908    343   .077    11.2      70   26.4    26    15.9
3 60 PCT T      2637   1.330   13.93   1875   16.089  13295     232    2369    549   .197    39.2     348   80.7    52     9.8
4 30 PCT T      2497   1.210   13.19   1900   19.898   8573     144    1936    273   .077    11.1     111   21.0    26    15.9
5 10 PCT T      2037   1.080   13.19    588   19.429   5625      74     851     76   .057     4.5      48    4.3     9    19.5
6 30 PCT T      2494   1.330   13.19   1363   19.715   8573     143    1565    269   .077    11.0     121   20.3    26    15.9
7 90 PCT T      2910   5.210   11.53    563   17.031  21910     366   13230    235   .113    41.3    1495   26.6    78     2.9
8 30 PCT T      2452   1.990   13.19   1338   19.875   8573     141    1735    256   .077    10.9     134   19.7    26    15.9
9 C.T.         31319   1.990    9.79    108    9.912   1996     669     638      7   .193    95.0      91    1.0     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     9.2     105    8.0
1 IDLE          2470   2.990    8.62     50   11.357   2091      99     909      3   .232    10.3     210     .7     0    18.7
2 30 PCT T      2625   1.050   13.19   1513   19.982   8573     156    1258    298   .077    12.0      97   22.9    26    15.9
3 60 PCT T      2730   1.570   13.29   1775   16.133  13295     239    2776    516   .197    35.1     908   75.8    52     9.8
4 30 PCT T      2593   1.330   13.29   1925   19.879   8573     147    1548    273   .077    11.3     119   21.0    26    15.9
5 10 PCT T      2222   1.330   13.19    588   19.698   5625      85    1029     75   .057     4.8      59    4.3     9    19.5
6 30 PCT T      2633   1.930   13.19   1988   19.833   8573     152    1669    286   .077    11.7     129   22.0    26    15.9
7 90 PCT T      3195   5.630   11.28    975   17.288  21910     391   14136    196   .113    44.2    1597   22.2    78     2.9
8 30 PCT T      2591   1.600   13.19   1388   19.999   8573     148    1897    263   .077    11.4     142   20.3    26    15.9
9 C.T.         39759   1.790    9.65    112    9.915   1996     700     728      7   .193   100.0     109    1.1     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     9.7     115    7.6
1 IDLE          2799   2.530    9.23     50   12.039   2091      97     866      3   .232    11.0     201     .7     0    18.7
2 30 PCT T      2502   1.160   13.19   1525   19.558   8573     152    1380    298   .077    11.7     106   23.0    26    15.9
3 60 PCT T      2780   1.990   13.19   1750   15.388  13295     290    3380    501   .197    35.2     497   73.7    52     9.8
4 30 PCT T      2998   1.130   13.29   1625   19.665   8573     193    1339    315   .077    11.0     103   24.3    26    15.9
5 10 PCT T      2222   1.180   13.29    525   19.692   5625      88     913     79   .057     4.8      52    4.5     9    19.5
6 30 PCT T      2499   1.180   13.29   1650   19.719   8573     195    1388    319   .077    11.2     107   24.6    26    15.9
7 90 PCT T      2953   4.920   11.66    675   16.875  21910     375   12609    284   .113    42.3    1425   32.1    78     2.9
8 30 PCT T      2951   1.270   13.29   1675   19.805   8573     192    1486    322   .077    10.9     114   24.8    26    15.9
9 C.T.         34075   1.940    5.07    130   10.917   1996     653     751      8   .193    93.4     107    1.2     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     9.3     109    8.4
1 IDLE          2799   2.530    9.23     50   12.039   2091      97     866      3   .232    11.0     201     .7     0    18.7
2 30 PCT T      2763   1.160   13.19   1563   19.576   8573     162    1378    305   .077    12.5     106   23.5    26    15.9
3 60 PCT T      2782   1.860   13.29   1813   15.428  13295     239    3226    517   .197    35.1     474   76.0    52     9.8
4 30 PCT T      2993   1.270   13.19   1625   19.659   8573     196    1500    316   .077    11.2     116   24.3    26    15.9
5 10 PCT T      1903   1.080   13.29    500   19.560   5625      74     893     64   .057     4.2      48    3.7     9    19.5
6 30 PCT T      2903   1.160   13.29   1713   19.690   8573     190    1367    332   .077    10.8     105   25.6    26    15.9
7 90 PCT T      2996   4.920   11.53    650   16.750  21910     383   12709    276   .113    43.3    1436   31.2    78     2.9
8 30 PCT T      2729   1.960   13.19   1575   19.872   8573     157    1700    301   .077    12.1     131   23.2    26    15.9
9 C.T.         35667   1.860    9.79    125   10.217   1996     697     734      8   .193    99.6     105    1.2     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     9.6     109    8.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     9.4     110    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     9.5     109    8.4
FOUR CYCLE COMPOSITE =
                                  HC- FID  0.35(     9.4) + 0.65(     9.5) =     9.465   GM/BHP HR
                                  CO- NDIR 0.35(   110.1) + 0.65(   109.0) =   109.363   GM/BHP HR
                                  NO2-CL   0.35(     7.8) + 0.65(     8.4) =     8.190   GM/BHP HR
                                                       CORRECTED NO2 =     8.352   GM/BHP HR
                                                                BSFC =      .715   LB/BHP HR
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                           TABLE E-16. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 5-0   TEST-28  RUN-2   1972 STANDARD          06-07-73      K = .970      HUM = 66.3  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR                MAN.
MODE            HC      CO      CO2     NO   CARBON   CONS.     HC       CO     NO2    FACT.     HC      CO     NO2     HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          164   2.580    8.47     78   11.227    2041     32      947      5     .232     7.5     220     1.1     0     18.7
2 30 PCT T      164   1.300   12.93   1388   14.407    8573    105     1563    279     .077     8.1     120    21.1    26     15.9
3 60 PCT T      160   1.980   13.00   1624   15.153   13245    151     3496    471     .147    22.2     514    69.3    52      9.8
4 30 PCT T      143   1.860   12.59   1407   14.604    8573     91     2206    279     .077     7.0     170    21.1    26     15.9
5 10 PCT T      108   1.270   13.07    533   14.457    5625     45      998     69     .057     2.6      57     3.9     9     19.5
6 30 PCT T      141   1.410   13.14   1614   14.702    8573     88     1661    313     .077     6.8     128    24.1    26     15.9
7 90 PCT T      169   5.760   11.28    526   17.223   21910    227    14464    217     .113    25.6    1634    24.5    78      2.9
8 30 PCT T      138   1.570   12.86   1564   14.579    8573     87     1865    305     .077     6.7     144    23.5    26     15.9
9 C.T.         2369   1.790    4.93     86    9.279    1996    550      778      6     .143    78.7     111      .9     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      6.6     124     7.6
1 IDLE          164   2.580    8.47     78   11.227    2041     32      947      5     .232     7.5     220     1.1     0     18.7
2 30 PCT T      150   1.390   13.00   1554   14.552    8573     95     1654    304     .077     7.3     127    23.4    26     15.9
3 60 PCT T      150   2.330   13.07   1564   15.562   13245    138     4006    442     .147    20.3     589    65.0    52      9.8
4 30 PCT T      141   1.590   13.14   1564   14.882    8573     88     1850    299     .077     6.8     142    23.0    26     15.9
5 10 PCT T      103   1.380   13.14    497   14.631    5625     43     1072     63     .057     2.4      61     3.6     9     19.5
6 30 PCT T      136   1.640   13.14   1554   14.927    8573     84     1903    296     .077     6.5     147    22.8    26     15.9
7 90 PCT T      167   5.820   11.22    555   17.220   21910    224    14617    229     .113    25.3    1652    25.9    78      2.9
8 30 PCT T      143   2.020   13.07   1584   15.244    8573     87     2295    296     .077     6.7     177    22.8    26     15.9
9 C.T.         2340   1.860    5.07     88    9.457    1996    533      793      6     .143    76.3     113      .9     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      6.4     129     7.6
1 IDLE          141   2.910    8.87     78   11.932    2041     27      869      5     .232     6.3     202     1.1     0     18.7
2 30 PCT T      155   1.360   13.00   1604   14.527    8573     99     1621    314     .077     7.6     125    24.2    26     15.9
3 60 PCT T      150   2.450   12.92   1564   15.532   13245    138     4220    443     .147    20.3     620    65.1    52      9.8
4 30 PCT T      138   1.860   13.07   1524   15.079    8573     85     2136    288     .077     6.5     164    22.1    26     15.9
5 10 PCT T      103   1.390   13.14    555   14.641    5625     43     1074     71     .057     2.4      61     4.0     9     19.5
6 30 PCT T      133   1.570   13.14   1614   14.854    8573     83     1830    309     .077     6.4     141    23.8    26     15.9
7 90 PCT T      160   5.730   11.28    569   17.183   21910    215    14422    235     .113    24.3    1630    26.6    78      2.9
8 30 PCT T      136   1.880   13.14   1544   15.167    8573     83     2147    290     .077     6.4     165    22.3    26     15.9
9 C.T.         2297   1.830    5.07     75    9.381    1996    528      787      5     .143    75.5     112      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      6.2     129     7.6
1 IDLE          141   2.910    8.87     78   11.932    2041     27      869      5     .232     6.3     202     1.1     0     18.7
2 30 PCT T      157   1.640   12.92   1544   14.730    8573     99     1928    298     .077     7.6     148    23.0    26     15.9
3 60 PCT T      150   2.430   12.86   1446   15.452   13245    139     4208    412     .147    20.4     619    60.5    52      9.8
4 30 PCT T      141   1.960   12.92   1544   15.032    8573     87     2258    292     .077     6.7     174    22.5    26     15.9
5 10 PCT T      119   1.960   12.86    569   14.949    5625     49     1490     71     .057     2.8      85     4.1     9     19.5
6 30 PCT T      138   1.830   13.00   1544   14.979    8573     86     2116    293     .077     6.6     163    22.6    26     15.9
7 90 PCT T      167   6.050   11.04    497   17.270   21910    224    15150    205     .113    25.3    1712    23.1    78      2.9
8 30 PCT T      141   1.940   13.00   1485   15.092    8573     87     2226    280     .077     6.7     171    21.6    26     15.9
9 C.T.         2471   1.860    5.14     70    9.669    1996    551      776      5     .143    78.8     111      .7     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      6.5     136     7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------      6.5     127     7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------      6.4     132     7.4
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     6.5) + 0.65(     6.4) =     6.405   GM/BHP HR
                                          CO- NDIR 0.35(   126.8) + 0.65(   132.5) =   130.491   GM/BHP HR
                                          NO2-NDIR 0.35(     7.6) + 0.65(     7.4) =     7.463   GM/BHP HR
                                                               CORRECTED NO2 =     7.238   GM/BHP HR
                                                                        BSFC =      .715   LB/BHP HR
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR                MAN.
MODE           HC-FID    CO      CO2  NO-CL  CARBON   CONS.     HC       CO     NO2    FACT.  HC-FID     CO  NO2-CL     HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         2469   2.580    8.47     37   11.297    2041     45      942      2     .232    10.3     218      .5     0     18.7
2 30 PCT T     2671   1.300   12.93   1281   14.497    8573    158     1553    252     .077    12.2     120    19.4    26     15.9
3 60 PCT T     2733   1.980   13.00   1712   15.253   13245    237     3473    494     .147    34.9     511    72.6    52      9.8
4 30 PCT T     2494   1.860   12.59   1387   14.699    8573    145     2191    269     .077    11.2     169    20.7    26     15.9
5 10 PCT T     1903   1.270   13.07    493   14.530    5625     74      993     63     .057     4.2      57     3.6     9     19.5
6 30 PCT T     2428   1.410   13.14   1525   14.793    8573    141     1651    293     .077    10.8     127    22.6    26     15.9
7 90 PCT T     2964   5.760   11.28    475   17.336   21910    366    14369    195     .113    41.4    1624    22.0    78      2.9
8 30 PCT T     2426   1.570   12.86   1507   14.673    8573    142     1853    292     .077    10.9     143    22.5    26     15.9
9 C.T.        29316   1.790    4.93     89    9.652    1996    606      748      6     .143    86.7     107      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      8.9     123     7.4
1 IDLE         2469   2.580    8.47     37   11.297    2041     45      942      2     .232    10.3     218      .5     0     18.7
2 30 PCT T     2629   1.390   13.00   1462   14.653    8573    154     1643    284     .077    11.8     126    21.9    26     15.9
3 60 PCT T     2742   2.330   13.07   1446   15.674   13245    232     3977    420     .147    34.1     585    61.7    52      9.8
4 30 PCT T     2545   1.590   13.14   1483   14.985    8573    146     1838    282     .077    11.2     141    21.7    26     15.9
5 10 PCT T     2092   1.380   13.14    458   14.729    5625     78     1065     58     .057     4.4      61     3.3     9     19.5
6 30 PCT T     2592   1.640   13.14   1533   15.039    8573    148     1888    290     .077    11.4     145    22.3    26     15.9
7 90 PCT T     3056   5.820   11.22    496   17.346   21910    377    14511    203     .113    42.6    1640    23.0    78      2.9
8 30 PCT T     2598   2.020   13.07   1575   15.350    8573    145     2279    292     .077    11.2     175    22.5    26     15.9
9 C.T.        29795   1.860    5.07     87    9.909    1996    600      757      6     .143    85.8     108      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      8.9     128     7.1
1 IDLE         2562   2.910    8.87     50   11.836    2041     45      861      3     .232    10.5     200      .7     0     18.7
2 30 PCT T     2809   1.360   13.00   1504   14.641    8573    165     1609    292     .077    12.7     124    22.5    26     15.9
3 60 PCT T     2833   2.450   12.92   1429   15.653   13245    240     4188    401     .147    35.2     616    59.0    52      9.8
4 30 PCT T     2690   1.860   13.07   1454   15.199    8573    149     2120    272     .077    11.5     163    21.0    26     15.9
5 10 PCT T     2110   1.390   13.14    512   14.741    5625     81     1071     65     .057     4.6      61     3.7     9     19.5
6 30 PCT T     2704   1.570   13.14   1521   14.980    8573    155     1815    289     .077    11.9     140    22.3    26     15.9
7 90 PCT T     3055   5.730   11.28    512   17.316   21910    378    14312    210     .113    42.7    1617    23.8    78      2.9
8 30 PCT T     2574   1.880   13.14   1400   15.277    8573    144     2131    261     .077    11.1     164    20.1    26     15.9
9 C.T.        31064   1.830    5.07     87   10.006    1996    620      737      6     .143    88.6     105      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      9.2     128     7.0
1 IDLE         2562   2.910    8.87     50   11.536    2041     45      861      3     .232    10.5     200      .7     0     18.7
2 30 PCT T     2950   1.640   12.92   1425   14.855    8573    170     1912    273     .077    13.1     147    21.0    26     15.9
3 60 PCT T     2831   2.430   12.86   1450   15.573   13245    241     4175    409     .147    35.4     614    60.2    52      9.8
4 30 PCT T     2639   1.960   12.92   1376   15.144    8573    149     2241    258     .077    11.5     173    19.9    26     15.9
5 10 PCT T     2456   1.960   12.86    512   15.066    5625     92     1478     63     .057     5.2      84     3.6     9     19.5
6 30 PCT T     2461   1.830   13.00   1442   15.076    8573    151     2099    272     .077    11.6     162    20.9    26     15.9
7 90 PCT T     3104   6.050   11.04    443   17.400   21910    382    15037    181     .113    43.2    1699    20.4    78      2.9
8 30 PCT T     2691   1.940   13.00   1425   15.209    8573    149     2210    267     .077    11.5     170    20.6    26     15.9
9 C.T.        30718   1.860    5.14     85   10.072    1996    609      745      6     .143    87.1     106      .8     0     24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      9.2     135     6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------      8.9     126     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------      9.2     131     6.9
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     8.9) + 0.65(     9.2) =     9.099   GM/BHP HR
                                          CO- NDIR 0.35(   125.8) + 0.65(   131.2) =   129.392   GM/BHP HR
                                          NO2-CL   0.35(     7.3) + 0.65(     6.9) =     6.999   GM/BHP HR
                                                               CORRECTED NO2 =     6.764   GM/BHP HR
                                                                        BSFC =      .715   LB/BHP HR
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                       TABLE E-17. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 5-U   TEST-28  RUN-3   1972 STANDARD         06-07-73      K = .926     HUM = 54.9  GR/LB
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                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
MODE             HC      CO     CO2      NO    CARBON   CONS.     HC      CO     NO2   FACT.    HC      CO    NO2    HP   VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE           84   1.240    8.42      84     9.751    2041     19     524      6   .232     4.4    122    1.4     0   18.7
2 30 PCT T      121   1.100   12.86    1529    14.091    8573     80    1352    308   .077     6.1    104   23.7    26   15.9
3 60 PCT T      126   1.620   13.14    1856    14.896   13245    121    2910    548   .147    17.8    428   80.5    52    9.8
4 30 PCT T      117   1.180   13.00    1749    14.306    8573     76    1428    348   .077     5.8    110   26.8    26   15.9
5 10 PCT T       76    .980   13.00     569    14.062    5625     33     792     76   .057     1.9     45    4.3     9   19.5
6 30 PCT T      112   1.160   13.14    1749    14.421    8573     72    1393    345   .077     5.5    107   26.6    26   15.9
7 90 PCT T      150   4.980   11.66     720    16.802   21410    206   12818    305   .113    23.3   1448   34.4    78    2.9
8 30 PCT T      112   1.270   13.29    1749    14.681    8573     71    1498    339   .077     5.9    115   26.1    26   15.9
9 C.T.         2699   1.830    4.65      60     9.391    1996    611     790      4   .143    87.4    113     .6     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        6.3    104    9.0
1 IDLE           84   1.240    8.42      84     9.751    2041     19     524      6   .232     4.4    122    1.4     0   18.7
2 30 PCT T      140   1.390   13.00    1629    14.541    8573     89    1655    318   .077     6.9    127   24.5    26   15.9
3 60 PCT T      140   2.490   12.86    1485    15.501   13245    129    4298    421   .147    19.0    632   61.9    52    9.8
4 30 PCT T      131   1.660   13.14    1604    14.941    8573     81    1924    306   .077     6.3    148   23.5    26   15.9
5 10 PCT T      102   1.490   13.14     614    14.740    5625     42    1149     78   .057     2.4     65    4.4     9   19.5
6 30 PCT T      126   1.490   13.14    1665    14.766    8573     79    1797    321   .077     6.1    138   24.7    26   15.9
7 90 PCT T      154   5.570   11.28     569    17.016   21410    209   14187    238   .113    23.6   1600   26.9    78    2.9
8 30 PCT T      131   1.830   13.00    1569    14.971    8573     81    2117    297   .077     6.2    163   22.9    26   15.9
9 C.T.         2647   1.590    5.11      68     9.559    1996    597     671      5   .143    85.4     96     .7     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        6.4    124    7.7
1 IDLE          135   2.950    8.42      47    11.516    2041     26     877      6   .232     6.0    203    1.4     0   18.7
2 30 PCT T      140   1.570   13.00    1584    14.721    8573     88    1847    291   .077     6.8    142   22.4    26   15.9
3 60 PCT T      140   1.940   13.14    1834    15.231   13245    131    3408    529   .147    19.3    501   77.8    52    9.8
4 30 PCT T      131   1.860   13.00    1446    15.001    8573     81    2147    274   .077     6.2    165   21.1    26   15.9
5 10 PCT T      107   1.570   12.86     614    14.546    5625     45    1226     79   .057     2.5     70    4.5     9   19.5
6 30 PCT T      131   1.570   13.14    1624    14.851    8573     82    1831    311   .077     6.3    141   24.0    26   15.9
7 90 PCT T      159   5.390   11.41     674    16.972   21410    217   13735    282   .113    24.5   1552   31.9    78    2.9
8 30 PCT T      131   1.660   13.14    1604    14.941    8573     81    1924    306   .077     6.3    148   23.6    26   15.9
9 C.T.         2661   1.720    4.87      61     9.464    1996    606     733      4   .143    86.7    105     .6     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        6.6    121    8.3
1 IDLE          135   2.950    8.42      47    11.516    2041     26     877      6   .232     6.0    203    1.4     0   18.7
2 30 PCT T      150   1.460   13.00    1686    14.622    8573     95    1729    328   .077     7.3    133   25.3    26   15.9
3 60 PCT T      140   2.250   13.00    1686    15.401   13245    130    3909    481   .147    19.1    575   70.8    52    9.8
4 30 PCT T      131   1.680   13.00    1564    14.821    8573     82    1963    300   .077     6.3    151   23.1    26   15.9
5 10 PCT T      102   1.720   12.86     483    14.690    5625     42    1330     61   .057     2.4     76    3.5     9   19.5
6 30 PCT T      135   1.600   13.00    1564    14.746    8573     85    1879    302   .077     6.5    145   23.2     9   19.5
7 90 PCT T      154   5.030   11.53     705    16.726   21410    213   13006    300   .113    24.1   1470   33.9    78    2.9
8 30 PCT T      135   1.830   13.14    1584    15.116    8573     83    2097    298   .077     6.4    161   23.0    26   15.9
9 C.T.         2527   1.790    4.80      62     9.319    1996    585     774      4   .143    83.6    111     .6     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        6.5    121    8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------        6.4    114    8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------        6.5    121    8.3
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     6.4) + 0.65(     6.5) =     6.484   GM/BHP HR
                                          CO- NDIR 0.35(   113.9) + 0.65(   121.4) =   118.749   GM/BHP HR
                                          NO2-NDIR 0.35(     8.3) + 0.65(     8.3) =     8.282   GM/BHP HR
                                                              CORRECTED NO2 =     7.671   GM/BHP HR
                                                                       BSFC =      .715   LB/BHP HR
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               CONCENTRATION AS MEASURED       TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR           MAN.
MODE           HC-FID     CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL   HP   VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          1743   1.240    8.42      50     9.834    2041     36     520      3   .232     8.4    121     .8     0   18.7
2 30 PCT T      2710   1.100   12.86    1437    14.231    8573    163    1339    287   .077    12.6    103   22.1    26   15.9
3 60 PCT T      2819   1.620   13.14    1762    15.042   13245    248    2881    515   .147    36.5    424   75.7    52    9.8
4 30 PCT T      2579   1.180   13.00    1662    14.438    8573    153    1415    328   .077    11.8    109   25.2    26   15.9
5 10 PCT T      1717    .980   13.00     512    14.152    5625     68     787     68   .057     3.9     45    3.9     9   19.5
6 30 PCT T      2310   1.160   13.14    1662    14.531    8573    136    1382    326   .077    10.5    106   25.1    26   15.9
7 90 PCT T      2908   4.980   11.66     700    16.931   21410    368   12721    294   .113    41.6   1437   33.2    78    2.9
8 30 PCT T      2360   1.270   13.29    1662    14.796    8573    137    1486    320   .077    10.5    114   24.6    26   15.9
9 C.T.         34342   1.830    4.65      25     9.914    1996    691     744      2   .143    98.9    106     .2     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        9.4    103    8.5
1 IDLE          1743   1.240    8.42      50     9.834    2041     36     520      3   .232     8.4    121     .8     0   18.7
2 30 PCT T      2719   1.390   13.00    1525    14.662    8573    159    1692    296   .077    12.2    130   22.8    26   15.9
3 60 PCT T      2878   2.490   12.86    1450    15.638   13245    244    4260    408   .147    35.8    626   59.9    52    9.8
4 30 PCT T      2683   1.660   13.14    1562    15.068    8573    153    1908    295   .077    11.8    147   22.7    26   15.9
5 10 PCT T      2271   1.490   13.14     562    14.857    5625     86    1140     71   .057     4.9     65    4.0     9   19.5
6 30 PCT T      2634   1.490   13.14    1625    14.893    8573    152    1733    311   .077    11.7    133   23.9    26   15.9
7 90 PCT T      3190   5.570   11.28     525    17.169   21410    398   14031    217   .113    45.0   1585   24.6    78    2.9
8 30 PCT T      2684   1.830   13.00    1500    15.098    8573    152    2099    283   .077    11.7    162   21.8    26   15.9
9 C.T.         36632   1.590    5.11      25    10.363    1996    704     619      2   .143   100.7     89     .2     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        9.7    122    7.2
1 IDLE          2658   2.950    8.42      50    11.636    2041     47     868      3   .232    10.8    201     .7     0   18.7
2 30 PCT T      2906   1.570   13.00    1425    14.861    8573    168    1830    273   .077    12.9    141   21.0    26   15.9
3 60 PCT T      2872   1.940   13.14    1737    15.367   13245    247    3378    497   .147    36.4    497   73.1    52    9.8
4 30 PCT T      2730   1.860   13.00    1450    15.133    8573    155    2188    273   .077    11.9    169   21.0    26   15.9
5 10 PCT T      2267   1.570   12.86     600    14.657    5625     87    1217     76   .057     5.0     69    4.3     9   19.5
6 30 PCT T      2681   1.570   13.14    1600    14.978    8573    153    1815    304   .077    11.8    140   23.4    26   15.9
7 90 PCT T      3193   5.390   11.41     575    17.119   21410    393   13621    239   .113    44.4   1539   27.0    78    2.9
8 30 PCT T      2638   1.660   13.14    1525    15.064    8573    150    1904    288   .077    11.6    147   22.2    26   15.9
9 C.T.         33951   1.720    4.87      26     9.985    1996    679     695      2   .143    97.0     99     .2     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        9.7    120    7.7
1 IDLE          2658   2.950    8.42      50    11.636    2041     47     868      3   .232    10.8    201     .7     0   18.7
2 30 PCT T      2902   1.460   13.00    1625    14.750    8573    169    1714    314   .077    13.0    132   24.1    26   15.9
3 60 PCT T      2921   2.250   13.00    1700    15.542   13245    249    3873    481   .147    36.6    569   70.7    52    9.8
4 30 PCT T      2726   1.680   13.00    1500    14.953    8573    156    1946    286   .077    12.0    150   22.0    26   15.9
5 10 PCT T      2361   1.720   12.86     487    14.816    5625     90    1314     61   .057     5.1     75    3.5     9   19.5
6 30 PCT T      2815   1.600   13.00    1537    14.881    8573    162    1862    294   .077    12.5    143   22.6    26   15.9
7 90 PCT T      3091   5.030   11.53     675    16.869   21410    392   12896    284   .113    44.3   1457   32.1    78    2.9
8 30 PCT T      2687   1.830   13.14    1512    15.239    8573    151    2080    282   .077    11.6    160   21.7    26   15.9
9 C.T.         36285   1.790    4.80      26    10.218    1996    709     706      2   .143   101.4    101     .2     0   24.9
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------        9.9    120    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------        9.6    113    7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------        9.8    120    7.8
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     9.6) + 0.65(     9.8) =     9.721   GM/BHP HR
                                          CO- NDIR 0.35(   112.7) + 0.65(   120.0) =   117.464   GM/BHP HR
                                          NO2-CL   0.35(     7.9) + 0.65(     7.8) =     7.841   GM/BHP HR
                                                              CORRECTED NO2 =     7.262   GM/BHP HR
                                                                       BSFC =      .715   LB/BHP HR
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                     TABLE E-18. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 5-1   TEST 25 RUN-2   EGR-AIR-CAT             05-31-73      K =1.077      HUM =105.7  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE         HC      CO     CO2     NO    CARBON    CONS.      HC     CO     NO2    FACT.   HC       CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       19    .010   10.10     61   10.131    2132        4      4      4    .232    1.0       1    1.0     0   18.5
2 30 PCT T   23    .010   11.28    526   11.315    7983       18     14    123    .077    1.3       1    9.5    25   15.0
3 60 PCT T   23    .010   13.14    385   13.175   14515       27     22    141    .147    4.0       3   20.7    50    9.0
4 30 PCT T   23    .010   11.28    659   11.315    7983       18     14    154    .077    1.3       1   11.9    25   15.0
5 10 PCT T   23    .010   10.10    295   10.135    5715       14     11     55    .057     .8       1    3.1     9   19.0
6 30 PCT T   23    .010   11.28    675   11.315    7983       18     14    158    .077    1.3       1   12.2    25   15.0
7 90 PCT T   28    .310   14.49    674   14.830   19051       39    804    287    .113    4.4      91   32.5    75    3.0
8 30 PCT T   23    .010   11.16    644   11.195    7983       18     14    152    .077    1.4       1   11.7    25   15.0
9 C.T.       23    .010    7.39     81    7.425    2087        7      6      8    .143    1.0       1    1.1     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7       4    4.3
1 IDLE       19    .010   10.10     61   10.131    2132        4      4      4    .232    1.0       1    1.0     0   18.5
2 30 PCT T   19    .010   11.16    599   11.191    7983       15     14    142    .077    1.1       1   10.9    25   15.0
3 60 PCT T   23    .010   13.29    455   13.325   14515       27     22    165    .147    4.0       3   24.2    50    9.0
4 30 PCT T   19    .010   11.16    674   11.191    7983       15     14    160    .077    1.1       1   12.3    25   15.0
5 10 PCT T   19    .010   10.10    358   10.131    5715       12     11     67    .057     .7       1    3.8     9   19.0
6 30 PCT T   19    .010   11.16    690   11.191    7983       15     14    163    .077    1.1       1   12.6    25   15.0
7 90 PCT T   23    .080   14.33   1046   14.435   19051       33    213    450    .113    3.7      24   51.0    75    3.0
8 30 PCT T   20    .010   11.16    629   11.192    7983       15     14    149    .077    1.2       1   11.5    25   15.0
9 C.T.       21    .010    7.48     38    7.513    2087        6      6      7    .143     .9       1    1.0     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .6       1    5.3
1 IDLE       19    .010   10.10     48   10.131    2132        4      4      3    .232    1.0       1     .8     0   18.5
2 30 PCT T   23    .010   11.16    599   11.195    7983       18     14    142    .077    1.4       1   10.9    25   15.0
3 60 PCT T   23    .010   13.93    441   13.965   14515       27     22    158    .147    3.9       3   23.2    50    9.0
4 30 PCT T   23    .010   11.04    659   11.075    7983       18     15    158    .077    1.4       1   12.1    25   15.0
5 10 PCT T   19    .010   10.10    331   10.131    5715       12     11     62    .057     .7       1    3.5     9   19.0
6 30 PCT T   19    .010   11.16    736   11.191    7983       15     15    174    .077    1.1       1   13.4    25   15.0
7 90 PCT T   23    .400   14.49    441   14.915   19051       32   1032    187    .113    3.6     117   21.1    75    3.0
8 30 PCT T   19    .010   11.41    614   11.441    7983       14     14    143    .077    1.1       1   11.0    25   15.0
9 C.T.       18    .010    7.48     63    7.509    2087        5      6      6    .143     .8       1     .8     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .6       5    4.0
1 IDLE       19    .010   10.10     48   10.131    2132        4      4      3    .232    1.0       1     .8     0   18.5
2 30 PCT T   19    .010   11.41    659   11.441    7983       14     14    153    .077    1.1       1   11.8    25   15.0
3 60 PCT T   19    .010   13.93    487   13.961   14515       22     22    153    .147    3.3       3   22.5    50    9.0
4 30 PCT T   19    .010   11.41    736   11.441    7983       14     14    171    .077    1.1       1   13.1    25   15.0
5 10 PCT T   19    .010   10.33    331   10.361    5715       11     11     61    .057     .6       1    3.5     9   19.0
6 30 PCT T   19    .010   11.53    767   11.561    7983       14     14    176    .077    1.1       1   13.5    25   15.0
7 90 PCT T   19    .240   14.33    705   14.591   19051       27    633    306    .113    3.0      72   34.5    75    3.0
8 30 PCT T   19    .010   11.28    659   11.311    7983       14     14    154    .077    1.1       1   11.9    25   15.0
9 C.T.       18    .010    7.48     70    7.509    2087        5      6      6    .143     .8       1     .9     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .5       3    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     .7       3    4.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     .6       4    4.3
FOUR CYCLE COMPOSITE -
                                     HC- NDIR 0.35(     .7) + 0.65(     .6) =     .605   GM/BHP HR
                                     CO- NDIR 0.35(    2.8) + 0.65(    4.3) =    3.783   GM/BHP HR
                                     NO2-NDIR 0.35(    4.8) + 0.65(    4.3) =    4.507   GM/BHP HR
                                                          CORRECTED NO2 =    4.855   GM/BHP HR
                                                                   BSFC =     .718   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE       HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC     CO     NO2    FACT.  HC-FID    CO   NO2-CL  HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       11    .010   10.10     45   10.111    2132        0      4      3    .232     .1       1     .7     0   18.5
2 30 PCT T   61    .010   11.28    545   11.296    7983        4     19    128    .077     .3       1    9.8    25   15.0
3 60 PCT T   34    .010   13.14    365   13.153   14515        4     22    130    .147     .5       3   19.1    50    9.0
4 30 PCT T   77    .010   11.28    625   11.298    7983        5     19    147    .077     .4       1   11.3    25   15.0
5 10 PCT T   77    .010   10.10    270   10.118    5715        4     11     81    .057     .2       1    2.9     9   19.0
6 30 PCT T   99    .010   11.28    670   11.300    7983        7     19    157    .077     .5       1   12.1    25   15.0
7 90 PCT T  131    .310   14.49    630   14.813   19051       17    805    269    .113    1.9      91   30.4    75    3.0
8 30 PCT T   72    .010   11.16    610   11.177    7983        5     19    145    .077     .4       1   11.1    25   15.0
9 C.T.       94    .010    7.39     31    7.409    2087        3      6      3    .143     .4       1     .4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .2       4    4.1
1 IDLE       11    .010   10.10     45   10.111    2132        0      4      3    .232     .1       1     .7     0   18.5
2 30 PCT T   99    .010   11.16    595   11.180    7983        7     19    141    .077     .5       1   10.9    25   15.0
3 60 PCT T  101    .010   13.29    430   13.310   14515       11     22    156    .147    1.6       3   22.9    50    9.0
4 30 PCT T   77    .010   11.16    655   11.178    7983        6     19    155    .077     .4       1   12.0    25   15.0
5 10 PCT T   71    .010   10.10    340   10.117    5715        4     11     64    .057     .2       1    3.6     9   19.0
6 30 PCT T   99    .010   11.16    690   11.180    7983        7     19    164    .077     .5       1   12.6    25   15.0
7 90 PCT T  113    .080   14.33    990   14.421   19051       15    213    434    .113    1.7      24   49.1    75    3.0
8 30 PCT T   72    .010   11.16    620   11.177    7983        5     19    147    .077     .4       1   11.3    25   15.0
9 C.T.       94    .010    7.48     38    7.499    2087        3      6      4    .143     .4       1     .5     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .2       1    5.1
1 IDLE       66    .010   10.10     50   10.117    2132        1      4      3    .232     .3       1     .8     0   18.5
2 30 PCT T   99    .010   11.16    595   11.180    7983        7     19    141    .077     .5       1   10.9    25   15.0
3 60 PCT T  101    .010   13.93    425   13.950   14515       11     22    152    .147    1.6       3   22.4    50    9.0
4 30 PCT T   77    .010   11.04    640   11.058    7983        6     15    153    .077     .4       1   11.8    25   15.0
5 10 PCT T   71    .010   10.10    325   10.117    5715        4     11     61    .057     .2       1    3.5     9   19.0
6 30 PCT T   94    .010   11.16    730   11.179    7983        7     19    173    .077     .5       1   13.3    25   15.0
7 90 PCT T  131    .400   14.49    490   14.903   19051       17   1033    208    .113    1.9     117   23.5    75    3.0
8 30 PCT T   72    .010   11.41    595   11.427    7983        5     19    138    .077     .4       1   10.6    25   15.0
9 C.T.       89    .010    7.48     33    7.499    2087        2      6      3    .143     .4       1     .4     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .3       5    4.0
1 IDLE       66    .010   10.10     50   10.117    2132        1      4      3    .232     .3       1     .8     0   18.5
2 30 PCT T  105    .010   11.41    642   11.431    7983        7     19    149    .077     .6       1   11.5    25   15.0
3 60 PCT T  101    .010   13.93    410   13.950   14515       11     22    147    .147    1.6       3   21.6    50    9.0
4 30 PCT T   77    .010   11.41    710   11.428    7983        5     19    165    .077     .4       1   12.7    25   15.0
5 10 PCT T   71    .010   10.33    315   10.347    5715        4     11     58    .057     .2       1    3.3     9   19.0
6 30 PCT T  100    .010   11.53    775   11.550    7983        7     19    178    .077     .5       1   13.7    25   15.0
7 90 PCT T  113    .240   14.33    690   14.581   19051       15    633    299    .113    1.7      72   33.8    75    3.0
8 30 PCT T   66    .010   11.28    635   11.297    7983        5     19    149    .077     .4       1   11.5    25   15.0
9 C.T.       89    .010    7.48     46    7.499    2087        2      6      4    .143     .4       1     .6     0   24.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .3       3    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     .2       3    4.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     .3       4    4.3
FOUR CYCLE COMPOSITE -
                                     HC- FID  0.35(     .2) + 0.65(     .3) =     .243   GM/BHP HR
                                     CO- NDIR 0.35(    2.8) + 0.65(    4.3) =    3.787   GM/BHP HR
                                     NO2-CL   0.35(    4.6) + 0.65(    4.3) =    4.388   GM/BHP HR
                                                          CORRECTED NO2 =    4.727   GM/BHP HR
                                                                   BSFC =     .718   LB/BHP HR
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                    TABLE E-19. MASS EMISSIONS BY NINE-MODE EPA
ENGINE S-1    TEST-25  RUN-3   EGR-AIR-CAT           05-31-73      K =1.031     HUM = 85.6  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR          MAN.
MODE           HC      CO     CO2     NO    CARBON   CONS.      HC      CO      NO2    FACT.    HC     CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         23    .010   10.10     60    10.135    2132       5       4        4    .232    1.2      1    1.0     0    18.5
2 30 PCT T     29    .010   11.41    483    11.451    7983      22      14      112    .077    1.7      1    8.6    25    15.0
3 60 PCT T     25    .010   13.58    412    13.617   14515      29      22      146    .147    4.2      3   21.4    50     9.0
4 30 PCT T     21    .010   11.47    621    11.503    7983      16      14      143    .077    1.2      1   11.0    25    15.0
5 10 PCT T     21    .010   10.33    378    10.363    5715      13      11       69    .057     .7      1    3.9     9    19.0
6 30 PCT T     23    .010   11.53    679    11.565    7983      17      14      154    .077    1.3      1   11.9    25    15.0
7 90 PCT T     27    .400   14.56    469    14.989   19051      37    1027      198    .113    4.2    116   22.4    75     3.0
8 30 PCT T     23    .010   11.60    651    11.635    7983      17      14      148    .077    1.3      1   11.4    25    15.0
9 C.T.         21    .010    7.63     77     7.663    2087       6       6        7    .143     .9      1    1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .7      5    3.8
1 IDLE         23    .010   10.10     60    10.135    2132       5       4        4    .232    1.2      1    1.0     0    18.5
2 30 PCT T     23    .010   11.53    599    11.565    7983      17      14      137    .077    1.3      1   10.6    25    15.0
3 60 PCT T     25    .010   13.73    399    13.767   14515      28      21      140    .147    4.2      3   20.5    50     9.0
4 30 PCT T     23    .010   11.53    679    11.568    7983      17      14      154    .077    1.3      1   11.9    25    15.0
5 10 PCT T     23    .010   10.33    357    10.365    5715      14      11       65    .057     .8      1    3.7     9    19.0
6 30 PCT T     25    .010   11.53    735    11.567    7983      19      14      168    .077    1.4      1   13.0    25    15.0
7 90 PCT T     28    .860   14.40    317    15.290   19051      38    2164      131    .113    4.3    245   14.8    75     3.0
8 30 PCT T     25    .010   11.53    659    11.567    7983      19      14      151    .077    1.4      1   11.6    25    15.0
9 C.T.         23    .010    7.60     75     7.635    2087       7       6        7    .143    1.0      1    1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .7     11    3.6
1 IDLE         21    .010   10.10     72    10.133    2132       5       4        5    .232    1.1      1    1.2     0    18.5
2 30 PCT T     23    .010   11.28    674    11.315    7983      18      14      158    .077    1.3      1   12.2    25    15.0
3 60 PCT T     23    .010   13.14    454    13.175   14515      27      22      166    .147    4.0      3   24.4    50     9.0
4 30 PCT T     23    .010   11.16    689    11.195    7983      18      14      163    .077    1.4      1   12.6    25    15.0
5 10 PCT T     23    .010   10.10    371    10.135    5715      14      11       69    .057     .8      1    4.0     9    19.0
6 30 PCT T     23    .010   11.28    782    11.315    7983      18      14      183    .077    1.3      1   14.1    25    15.0
7 90 PCT T     25    .310   14.25    614    14.587   19051      35     818      266    .113    4.0     92   30.1    75     3.0
8 30 PCT T     23    .010   11.28    659    11.315    7983      18      14      154    .077    1.3      1   11.9    25    15.0
9 C.T.         23    .010    7.55     75     7.585    2087       7       6        7    .143    1.0      1    1.0     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .7      4    4.6
1 IDLE         21    .010   10.10     72    10.133    2132       5       4        5    .232    1.1      1    1.2     0    18.5
2 30 PCT T     23    .010   11.53    659    11.565    7983      17      14      151    .077    1.3      1   11.6    25    15.0
3 60 PCT T     23    .010   13.93    483    13.965   14515      27      22      173    .147    3.9      3   25.4    50     9.0
4 30 PCT T     23    .010   11.22    720    11.255    7983      18      14      170    .077    1.4      1   13.1    25    15.0
5 10 PCT T     23    .010   10.10    330    10.135    5715      14      11       62    .057     .8      1    3.5     9    19.0
6 30 PCT T     25    .010   11.28    767    11.317    7983      19      14      180    .077    1.5      1   13.8    25    15.0
7 90 PCT T     25    .350   14.33    526    14.707   19051      35     916      226    .113    4.0    103   25.6    75     3.0
8 30 PCT T     23    .010   11.53    674    11.565    7983      17      14      154    .077    1.3      1   11.9    25    15.0
9 C.T.         23    .010    7.60     70     7.635    2087       7       6        6    .143    1.0      1     .9     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .7      5    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------           .7      8    3.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------           .7      4    4.5
FOUR CYCLE COMPOSITE =
                                    HC- NDIR 0.35(      .7) + 0.65(      .7) =      .682    GM/BHP HR
                                    CO- NDIR 0.35(     7.9) + 0.65(     4.5) =     5.665    GM/BHP HR
                                    NO2-NDIR 0.35(     3.7) + 0.65(     4.5) =     4.249    GM/BHP HR
                                                          CORRECTED NO2 =     4.382    GM/BHP HR
                                                                   BSFC =      .718    LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR            MAN.
MODE          HC-FID    CO     CO2  NO-CL   CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        120    .010   10.10     43    10.122    2132       3       4        3    .232     .6      1     .7     0    18.5
2 30 PCT T    144    .010   11.41    505    11.434    7983      10      14      117    .077     .8      1    9.0    25    15.0
3 60 PCT T    122    .010   13.58    370    13.602   14515      13      22      131    .147    1.9      3   19.3    50     9.0
4 30 PCT T     88    .010   11.47    585    11.489    7983       6      14      135    .077     .5      1   10.4    25    15.0
5 10 PCT T     77    .010   10.33    315    10.348    5715       4      11       58    .057     .2      1    3.3     9    19.0
6 30 PCT T    108    .010   11.53    630    11.551    7983       7      14      145    .077     .6      1   11.1    25    15.0
7 90 PCT T    148    .400   14.56    390    14.975   19051      19    1028      166    .113    2.1    116   18.6    75     3.0
8 30 PCT T     78    .010   11.60    595    11.618    7983       5      14      136    .077     .4      1   10.5    25    15.0
9 C.T.         94    .010    7.63     31     7.649    2087       3       6        3    .143     .4      1     .4     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .3      5    3.4
1 IDLE        120    .010   10.10     43    10.122    2132       3       4        3    .232     .6      1     .7     0    18.5
2 30 PCT T    102    .010   11.53    555    11.550    7983       7      14      127    .077     .5      1    9.8    25    15.0
3 60 PCT T    105    .010   13.73    375    13.750   14515      11      21      131    .147    1.6      3   19.3    50     9.0
4 30 PCT T     80    .010   11.53    630    11.548    7983       6      14      145    .077     .4      1   11.1    25    15.0
5 10 PCT T     77    .010   10.33    320    10.348    5715       4      11       59    .057     .2      1    3.3     9    19.0
6 30 PCT T    100    .010   11.53    710    11.550    7983       7      14      163    .077     .5      1   12.5    25    15.0
7 90 PCT T    186    .860   14.40    290    15.279   19051      23    2166      120    .113    2.6    245   13.6    75     3.0
8 30 PCT T     75    .010   11.53    620    11.548    7983       5      14      142    .077     .4      1   11.0    25    15.0
9 C.T.         94    .010    7.60     35     7.619    2087       3       6        3    .143     .4      1     .5     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .3     11    3.4
1 IDLE         71    .010   10.10     48    10.117    2132       1       4        3    .232     .3      1     .8     0    18.5
2 30 PCT T     99    .010   11.28    630    11.300    7983       7      14      148    .077     .5      1   11.4    25    15.0
3 60 PCT T    105    .010   13.14    438    13.161   14515      12      22      160    .147    1.7      3   23.6    50     9.0
4 30 PCT T     81    .010   11.16    655    11.178    7983       6      14      155    .077     .4      1   12.0    25    15.0
5 10 PCT T     77    .010   10.10    346    10.118    5715       4      11       65    .057     .2      1    3.7     9    19.0
6 30 PCT T     99    .010   11.28    715    11.300    7983       7      14      168    .077     .5      1   12.9    25    15.0
7 90 PCT T    130    .310   14.25    540    14.573   19051      17     819      234    .113    1.9     93   26.5    75     3.0
8 30 PCT T     77    .010   11.28    615    11.298    7983       5      14      144    .077     .4      1   11.1    25    15.0
9 C.T.         96    .010    7.55     30     7.570    2087       3       6        3    .143     .4      1     .4     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .3      4    4.2
1 IDLE         71    .010   10.10     48    10.117    2132       1       4        3    .232     .3      1     .8     0    18.5
2 30 PCT T    111    .010   11.53    625    11.551    7983       8      14      143    .077     .6      1   11.0    25    15.0
3 60 PCT T    101    .010   13.93    435    13.950   14515      11      22      156    .147    1.6      3   22.9    50     9.0
4 30 PCT T     77    .010   11.22    680    11.238    7983       5      14      160    .077     .4      1   12.3    25    15.0
5 10 PCT T     77    .010   10.10    297    10.118    5715       4      11       56    .057     .2      1    3.2     9    19.0
6 30 PCT T     99    .010   11.28    735    11.300    7983       7      14      172    .077     .5      1   13.3    25    15.0
7 90 PCT T    131    .350   14.33    450    14.693   19051      17     917      194    .113    1.9    104   21.9    75     3.0
8 30 PCT T     77    .010   11.53    618    11.548    7983       5      14      142    .077     .4      1   10.9    25    15.0
9 C.T.         96    .010    7.60     30     7.620    2087       3       6        3    .143     .4      1     .4     0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------           .3      5    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------           .3      8    3.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------           .3      4    4.1
FOUR CYCLE COMPOSITE =
                                    HC- FID  0.35(      .3) + 0.65(      .3) =      .283    GM/BHP HR
                                    CO- NDIR 0.35(     7.9) + 0.65(     4.5) =     5.670    GM/BHP HR
                                    NO2-CL   0.35(     3.4) + 0.65(     4.1) =     3.876    GM/BHP HR
                                                          CORRECTED NO2 =     3.997    GM/BHP HR
                                                                   BSFC =      .718    LB/BHP HR
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                          TABLE E-20. MASS EMISSIONS BY NINE-MODE EPA
ENGINE S-1   TEST 25  RUN-4    EGR-AIR-CAT                  05-31-73       K =1.089       HUM =112.7  GR/LB
-------------------------------------------------------------------------------------------------------------------------------
                  CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR               MAN.
MODE              HC      CO     CO2      NO    CARBON    CONS.      HC      CO     NO2    FACT.    HC        CO     NO2     HP     VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE            20    .010    9.88      54     9.912     2132       5       4       4    .232    1.1         1      .9      0    18.5
2 30 PCT T        28    .010   11.16     512    11.200     7983      22      14     121    .077    1.7         1     9.3     25    15.0
3 60 PCT T        23    .010   13.29     427    13.325    14515      27      22     154    .147    4.0         3    22.7     50     9.0
4 30 PCT T        23    .010   11.28     675    11.315     7983      18      14     158    .077    1.3         1    12.2     25    15.0
5 10 PCT T        23    .010   10.10     317    10.135     5715      14      11      59    .057     .8         1     3.4      9    19.0
6 30 PCT T        23    .010   11.91     720    11.945     7983      17      14     167    .077    1.3         1    12.8     25    15.0
7 90 PCT T        23    .480   14.40     469    14.908    19051      32    1239     199    .113    3.6       140    22.5     75     3.0
8 30 PCT T        23    .010   11.91     659    11.945     7983      17      14     153    .077    1.3         1    11.8     25    15.0
9 C.T.            23    .010    7.12      40     7.156     2087       7       6       4    .143    1.0         1      .6      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7         6     4.0
1 IDLE            20    .010    9.88      54     9.912     2132       5       4       4    .232    1.1         1      .9      0    18.5
2 30 PCT T        23    .010   11.28     690    11.315     7983      18      14     162    .077    1.3         1    12.4     25    15.0
3 60 PCT T        23    .010   13.31     455    13.345    14515      27      22     164    .147    4.0         3    24.2     50     9.0
4 30 PCT T        23    .010   11.28     720    11.315     7983      18      14     169    .077    1.3         1    13.0     25    15.0
5 10 PCT T        19    .010   10.10     331    10.131     5715      12      11      62    .057     .7         1     3.5      9    19.0
6 30 PCT T        23    .010   11.28     783    11.315     7983      18      14     183    .077    1.3         1    14.1     25    15.0
7 90 PCT T        25    .480   14.33     455    14.837    19051      35    1248     194    .113    3.9       141    21.9     75     3.0
8 30 PCT T        23    .010   11.91     729    11.945     7983      17      14     169    .077    1.3         1    13.0     25    15.0
9 C.T.            19    .010    7.21      52     7.241     2087       6       6       5    .143     .8         1      .7      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7         6     4.3
1 IDLE            19    .010    9.88      73     9.911     2132       4       4       5    .232    1.0         1     1.2      0    18.5
2 30 PCT T        20    .010   11.47     690    11.502     7983      15      14     159    .077    1.2         1    12.2     25    15.0
3 60 PCT T        23    .010   13.93     483    13.965    14515      27      22     173    .147    3.9         3    25.4     50     9.0
4 30 PCT T        23    .010   11.91     783    11.945     7983      17      14     181    .077    1.3         1    14.0     25    15.0
5 10 PCT T        20    .010   10.10     344    10.132     5715      12      11      64    .057     .7         1     3.7      9    19.0
6 30 PCT T        23    .010   11.28     830    11.315     7983      18      14     194    .077    1.3         1    15.0     25    15.0
7 90 PCT T        25    .570   14.33     385    14.927    19051      34    1470     163    .113    3.9       166    18.4     75     3.0
8 30 PCT T        20    .010   11.28     659    11.312     7983      15      14     154    .077    1.2         1    11.9     25    15.0
9 C.T.            19    .010    7.21      48     7.241     2087       6       6       5    .143     .8         1      .7      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .6         7     4.2
1 IDLE            19    .010    9.88      73     9.911     2132       4       4       5    .232    1.0         1     1.2      0    18.5
2 30 PCT T        20    .010   11.91     736    11.942     7983      15      14     170    .077    1.2         1    13.1     25    15.0
3 60 PCT T        23    .010   13.29     483    13.325    14515      27      22     175    .147    4.0         3    25.7     50     9.0
4 30 PCT T        23    .010   11.28     736    11.315     7983      18      14     172    .077    1.3         1    13.3     25    15.0
5 10 PCT T        23    .010   10.10     371    10.135     5715      14      11      69    .057     .8         1     4.0      9    19.0
6 30 PCT T        23    .010   11.28     790    11.315     7983      18      14     185    .077    1.3         1    14.2     25    15.0
7 90 PCT T        25    .710   14.25     385    14.987    19051      34    1823     162    .113    3.9       206    18.4     75     3.0
8 30 PCT T        23    .010   11.28     705    11.315     7983      18      14     165    .077    1.3         1    12.7     25    15.0
9 C.T.            20    .010    7.12      48     7.158     2087       6       6       5    .143     .9         1      .7      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7         9     4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .7         6     4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .6         8     4.3
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(      .7) + 0.65(      .6) =      .652   GM/BHP HR
                                         CO- NDIR 0.35(     6.2) + 0.65(     8.1) =     7.462   GM/BHP HR
                                         NO2-NDIR 0.35(     4.1) + 0.65(     4.3) =     4.218   GM/BHP HR
                                                              CORRECTED NO2 =     4.594   GM/BHP HR
                                                                       BSFC =      .718   LB/BHP HR
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                  CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR               MAN.
MODE           HC-FID     CO     CO2   NO-CL    CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL    HP     VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE           120    .010    9.88      45     9.902     2132       3       4       3    .232     .6         1      .7      0    18.5
2 30 PCT T       152    .010   11.16     553    11.185     7983      11      14     131    .077     .8         1    10.1     25    15.0
3 60 PCT T       124    .010   13.29     393    13.312    14515      13      22     142    .147    2.0         3    20.9     50     9.0
4 30 PCT T        88    .010   11.28     657    11.299     7983       6      14     154    .077     .5         1    11.9     25    15.0
5 10 PCT T        80    .010   10.10     295    10.118     5715       5      11      55    .057     .3         1     3.2      9    19.0
6 30 PCT T       111    .010   11.91     723    11.931     7983       8      14     168    .077     .6         1    12.9     25    15.0
7 90 PCT T       137    .480   14.40     435    14.894    19051      17    1240     185    .113    2.0       140    20.9     75     3.0
8 30 PCT T        77    .010   11.91     638    11.928     7983       5      14     148    .077     .4         1    11.4     25    15.0
9 C.T.            98    .010    7.12      45     7.140     2087       3       6       4    .143     .4         1      .6      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3         6     3.8
1 IDLE           120    .010    9.88      45     9.902     2132       3       4       3    .232     .6         1      .7      0    18.5
2 30 PCT T       110    .010   11.28     685    11.301     7983       8      14     161    .077     .6         1    12.4     25    15.0
3 60 PCT T       112    .010   13.31     415    13.331    14515      12      22     150    .147    1.8         3    22.1     50     9.0
4 30 PCT T        88    .010   11.28     690    11.299     7983       6      14     162    .077     .5         1    12.5     25    15.0
5 10 PCT T        79    .010   10.10     315    10.118     5715       4      11      59    .057     .3         1     3.4      9    19.0
6 30 PCT T       105    .010   11.28     765    11.300     7983       7      14     179    .077     .6         1    13.8     25    15.0
7 90 PCT T       136    .480   14.33     420    14.824    19051      18    1246     179    .113    2.0       141    20.3     75     3.0
8 30 PCT T        77    .010   11.91     700    11.928     7983       5      14     162    .077     .4         1    12.5     25    15.0
9 C.T.            99    .010    7.21      49     7.230     2087       3       6       5    .143     .4         1      .7      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3         6     4.1
1 IDLE            79    .010    9.88      50     9.898     2132       2       4       4    .232     .4         1      .8      0    18.5
2 30 PCT T       108    .010   11.47     670    11.491     7983       8      14     155    .077     .6         1    11.9     25    15.0
3 60 PCT T       112    .010   13.93     460    13.951    14515      12      22     165    .147    1.8         3    24.2     50     9.0
4 30 PCT T        88    .010   11.91     770    11.929     7983       6      14     179    .077     .5         1    13.7     25    15.0
5 10 PCT T        82    .010   10.10     325    10.118     5715       5      11      61    .057     .3         1     3.5      9    19.0
6 30 PCT T       110    .010   11.28     810    11.301     7983       8      14     190    .077     .6         1    14.6     25    15.0
7 90 PCT T       142    .570   14.33     443    14.914    19051      18    1471     188    .113    2.1       166    21.2     75     3.0
8 30 PCT T        83    .010   11.28     645    11.298     7983       6      14     151    .077     .5         1    11.7     25    15.0
9 C.T.           101    .010    7.21      38     7.230     2087       3       6       4    .143     .4         1      .5      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3         7     4.2
1 IDLE            79    .010    9.88      50     9.898     2132       2       4       4    .232     .4         1      .8      0    18.5
2 30 PCT T       130    .010   11.91     715    11.933     7983       9      14     166    .077     .7         1    12.8     25    15.0
3 60 PCT T       112    .010   13.29     445    13.311    14515      12      22     161    .147    1.8         3    23.7     50     9.0
4 30 PCT T        88    .010   11.28     710    11.299     7983       6      14     167    .077     .5         1    12.8     25    15.0
5 10 PCT T        87    .010   10.10     345    10.119     5715       5      11      65    .057     .3         1     3.7      9    19.0
6 30 PCT T       110    .010   11.28     790    11.301     7983       8      14     185    .077     .6         1    14.3     25    15.0
7 90 PCT T       159    .710   14.25     373    14.976    19051      20    1824     158    .113    2.3       206    17.8     75     3.0
8 30 PCT T        83    .010   11.28     670    11.298     7983       6      14     157    .077     .5         1    12.1     25    15.0
9 C.T.           101    .010    7.12      40     7.140     2087       3       6       4    .143     .4         1      .6      0    24.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3         9     4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .3         6     4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .3         8     4.2
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(      .3) + 0.65(      .3) =      .301   GM/BHP HR
                                         CO- NDIR 0.35(     6.2) + 0.65(     8.1) =     7.469   GM/BHP HR
                                         NO2-CL   0.35(     4.0) + 0.65(     4.2) =     4.086   GM/BHP HR
                                                              CORRECTED NO2 =     4.450   GM/BHP HR
                                                                       BSFC =      .718   LB/BHP HR
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TABLE E-21. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 5-0 TEST-27 RUN-1 1972 STANDARD 06-06-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	19.8	4.5	16.3	0	2731	3.010	9.88	55
2	1200	3.9	1	20.7	6.3	15.1	0	2439	2.410	11.53	80
3	1200	17.1	4	20.5	6.7	14.9	0	2896	1.900	12.31	140
4	1200	39.4	9	18.4	7.7	16.3	0	2193	.520	12.31	560
5	1200	55.1	13	17.1	8.7	16.4	0	2104	.280	12.59	950
6	1200	108.9	25	11.9	13.6	16.6	0	2191	.130	12.59	2325
7	1200	164.1	37	5.8	19.0	15.9	0	2018	.210	12.86	2350
8	1200	179.9	41	4.6	22.5	14.3	0	2998	2.210	12.45	1400
9	1200	202.2	46	2.0	24.3	14.1	0	3001	2.620	12.18	1475
10	1200	219.2	50	.4	26.8	13.3	0	3568	4.370	11.16	995
11	750	0.0	0	19.8	4.6	15.9	0	3224	2.830	10.10	65
12	1200	0.0	0	22.5	4.4	17.5	0	18526	2.290	8.82	30
13	2300	221.9	97	1.3	56.0	12.7	0	2351	4.690	11.79	1165
14	2300	204.8	90	[illegible].8	48.0	13.5	0	2290	2.700	13.00	1675
15	2300	182.5	80	4.4	43.0	14.0	0	2008	1.830	13.43	2150
16	2300	166.7	73	5.0	34.0	14.7	0	1226	.850	13.73	2400
17	2300	111.6	49	10.6	28.0	15.7	0	1037	.310	13.43	2550
18	2300	55.1	24	16.2	18.5	15.9	0	1171	.320	13.29	1625
19	2300	40.7	18	17.6	16.0	16.0	0	946	.310	13.29	1175
20	2300	18.3	8	19.4	13.5	16.0	0	631	.240	13.43	600
21	2300	3.9	2	20.4	11.5	16.1	0	450	.270	13.29	300
22	750	0.0	0	19.6	4.7	17.2	0	2363	1.720	10.68	25
23	2300	0.0	0	24.8	4.4	24.6	0	42578	.970	3.74	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	42.3	943	2.8	.070	0.0	I	R	R	R
2	0.0	49.1	981	5.4	.060	.1	0.0	55.13	1100.7	6.0
3	0.0	60.7	804	9.7	.060	.2	0.0	15.54	205.9	2.5
4	0.0	58.7	281	49.8	.050	.5	0.0	6.52	31.2	5.5
5	0.0	63.5	171	95.2	.030	.4	0.0	5.04	13.6	7.6
6	0.0	104.4	125	368.0	.060	1.5	0.0	4.20	5.0	14.8
7	0.0	131.0	275	506.6	0.000	0.0	0.0	3.49	7.3	13.5
8	0.0	204.5	3046	317.1	.040	1.6	0.0	4.98	74.1	7.7
9	0.0	219.1	3863	357.5	0.000	0.0	0.0	4.74	83.6	7.7
10	0.0	273.0	6755	252.8	0.000	0.0	0.0	5.45	134.9	5.0
11	0.0	50.8	900	3.4	.070	0.0	I	R	R	R
12	0.0	285.2	712	1.5	.120	0.0	I	R	R	R
13	0.0	357.3	14397	587.8	.025	2.4	0.0	3.68	148.2	6.0
14	0.0	313.1	7455	760.1	.055	4.9	0.0	3.49	83.1	8.5
15	0.0	253.4	4663	900.5	.035	2.8	0.0	3.17	58.4	11.3
16	0.0	128.6	1801	835.8	.060	4.4	0.0	1.76	24.7	11.4
17	0.0	95.1	575	776.7	.060	2.9	0.0	1.95	11.8	15.9
18	0.0	71.6	395	329.8	0.000	0.0	0.0	2.97	16.4	13.7
19	0.0	50.1	332	206.7	.065	1.2	0.0	2.81	18.6	11.6
20	0.0	28.1	216	88.8	0.000	0.0	0.0	3.51	27.0	11.1
21	0.0	17.3	209	38.2	0.000	0.0	0.0	10.11	122.4	22.4
22	0.0	39.9	586	1.4	.080	0.0	I	R	R	R
23	0.0	947.6	436	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.795	GRAM/BHP HR
	CO	71.687	GRAM/BHP HR
	NO2	10.488	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.667	LB/BHP HR

TABLE E-22. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 5-0 TEST-27 RUN-2 1972 STANDARD 06-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	750	0.0	0	19.9	4.6	15.8	0	2920	3.100	10.21	45
2	1200	3.9	1	21.0	6.5	15.2	0	2308	2.170	12.05	70
3	1200	17.1	4	20.4	6.8	15.6	0	2257	1.160	12.72	160
4	1200	39.4	9	18.5	7.9	16.3	0	2065	.500	12.72	510
5	1200	55.1	13	17.2	9.1	16.6	0	2015	.190	12.72	912
6	1200	110.2	25	11.8	13.8	16.6	0	2195	.120	12.86	2275
7	1200	166.8	38	5.5	20.5	15.5	0	2259	.550	13.43	2250
8	1200	182.5	42	4.4	23.3	14.1	0	2917	2.750	12.31	1200
9	1200	204.8	47	2.1	25.5	14.2	0	2735	2.490	12.59	1562
10	1200	221.9	51	.3	27.4	13.5	0	2978	4.050	11.66	1112
11	750	0.0	0	20.0	4.4	15.9	0	2783	2.750	10.44	55
12	1200	0.0	0	22.4	4.3	16.7	0	15470	2.330	9.02	20
13	2300	220.5	97	1.2	55.8	12.2	0	2785	6.280	11.04	675
14	2300	202.2	89	2.7	48.0	13.2	0	2345	3.560	12.59	1200
15	2300	181.1	79	4.4	43.0	13.6	0	2291	2.750	13.00	1500
16	2300	165.4	72	5.3	34.8	14.6	0	1272	.910	13.73	2200
17	2300	110.2	48	10.9	27.0	15.6	0	1083	.300	13.58	2550
18	2300	55.1	24	16.4	18.8	15.6	0	1218	.420	13.43	1600
19	2300	39.4	17	17.8	16.0	15.8	0	857	.320	13.43	1062
20	2300	17.1	7	19.7	12.8	15.7	0	632	.380	13.58	475
21	2300	3.9	2	20.7	11.5	15.9	0	406	.370	13.43	263
22	750	0.0	0	19.7	4.5	17.0	0	2675	2.410	9.99	43
23	2300	0.0	0	24.9	4.5	23.7	0	42589	1.120	3.62	2

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	44.8	961	2.3	.070	0.0	I	R	R	R
2	0.0	47.1	894	4.7	.060	.1	0.0	52.85	1003.7	5.3
3	0.0	49.3	512	11.6	.060	.2	0.0	12.63	131.1	3.0
4	0.0	55.1	270	45.2	.050	.5	0.0	6.12	29.9	5.0
5	0.0	63.4	121	95.3	.030	.4	0.0	5.04	9.6	7.6
6	0.0	104.1	115	358.2	.060	1.5	0.0	4.13	4.6	14.2
7	0.0	147.8	727	489.0	0.000	0.0	0.0	3.88	19.1	12.8
8	0.0	200.8	3824	274.3	.040	1.7	0.0	4.82	91.7	6.6
9	0.0	206.0	3789	390.7	0.000	0.0	0.0	4.40	81.0	8.3
10	0.0	231.2	6352	286.6	0.000	0.0	0.0	4.56	125.3	5.7
11	0.0	41.2	823	2.7	.070	0.0	I	R	R	R
12	0.0	234.0	712	1.0	.120	0.0	I	R	R	R
13	0.0	400.5	18245	322.3	.025	2.4	0.0	4.15	188.9	3.3
14	0.0	311.6	9556	529.4	.055	4.9	0.0	3.52	107.9	6.0
15	0.0	279.7	6781	607.9	.035	2.8	0.0	3.53	85.5	7.7
16	0.0	135.9	1965	780.8	.060	4.3	0.0	1.88	27.1	10.8
17	0.0	94.8	531	741.2	.060	2.9	0.0	1.97	11.0	15.4
18	0.0	74.4	518	324.2	0.000	0.0	0.0	3.08	21.5	13.4
19	0.0	44.9	339	185.0	.065	1.1	0.0	2.60	19.7	10.7
20	0.0	26.2	318	65.3	0.000	0.0	0.0	3.50	42.4	8.7
21	0.0	15.3	282	32.9	0.000	0.0	0.0	8.96	164.9	19.3
22	0.0	43.1	784	2.3	.080	0.0	I	R	R	R
23	0.0	966.0	513	.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.657	GRAM/BHP HR
	CO	86.101	GRAM/BHP HR
	NO2	8.849	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.673	LB/BHP HR

TABLE E-23. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 5-0   TEST-27   RUN-3   1972 STANDARD   06-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	750	0.0	0	19.8	4.6	16.3	0	2599	3.010	9.99	45
2	1200	3.9	1	20.6	6.4	15.4	0	2032	1.640	12.31	80
3	1200	17.1	4	20.4	6.6	15.1	0	2488	1.860	12.31	120
4	1200	39.4	9	18.4	8.1	16.4	0	1793	.330	12.72	530
5	1200	55.1	13	17.2	9.2	16.6	0	1836	.170	12.72	950
6	1200	111.6	25	11.7	14.4	16.5	0	1927	.120	12.86	2325
7	1200	166.8	38	5.7	19.8	15.6	0	1937	.330	13.29	2550
8	1200	182.5	42	4.4	21.7	14.3	0	2772	2.250	12.45	1375
9	1200	204.8	47	2.4	24.7	14.3	0	2684	2.250	12.59	1750
10	1200	223.2	51	.3	27.0	13.7	0	2833	3.190	12.18	1600
11	750	0.0	0	19.8	4.4	16.0	0	2510	2.700	10.33	55
12	1200	0.0	0	22.5	4.4	16.8	0	15010	2.290	8.92	20
13	2300	223.2	98	1.2	56.2	12.4	0	2773	5.510	11.28	925
14	2300	204.8	90	2.8	47.5	13.6	0	2378	2.920	12.59	1450
15	2300	182.5	80	4.0	42.3	13.8	0	2193	2.250	13.14	1700
16	2300	166.8	73	5.2	38.2	14.7	0	1087	.750	13.58	2312
17	2300	111.6	49	10.9	27.5	15.7	0	900	.240	13.29	2450
18	2300	55.1	24	16.5	18.5	15.7	0	1080	.340	13.14	1550
19	2300	40.7	18	17.9	16.8	15.8	0	855	.310	13.14	1050
20	2300	18.4	8	19.6	13.0	16.0	0	494	.230	13.14	525
21	2300	3.9	2	20.8	11.2	15.9	0	495	.430	13.14	275
22	750	0.0	0	19.7	4.7	16.7	0	2807	2.530	9.77	50
23	2300	0.0	0	24.9	4.5	23.9	0	43075	1.180	3.74	9

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	40.9	957	2.4	.070	0.0	I	R	R	R
2	0.0	41.7	680	5.4	.060	.1	0.0	46.78	762.6	6.1
3	0.0	51.7	780	8.3	.060	.2	0.0	13.22	199.7	2.1
4	0.0	49.8	185	48.9	.050	.5	0.0	5.53	20.6	5.4
5	0.0	58.6	110	100.7	.030	.4	0.0	4.65	8.7	8.0
6	0.0	95.5	120	382.8	.060	1.5	0.0	3.75	4.7	15.0
7	0.0	125.9	433	550.4	0.000	0.0	0.0	3.30	11.4	14.4
8	0.0	182.2	2987	300.0	.040	1.7	0.0	4.37	71.6	7.2
9	0.0	199.0	3370	430.9	0.000	0.0	0.0	4.25	72.0	9.2
10	0.0	221.6	5042	415.6	0.000	0.0	0.0	4.35	98.9	8.1
11	0.0	37.7	820	2.7	.070	0.0	I	R	R	R
12	0.0	235.7	726	1.0	.120	0.0	I	R	R	R
13	0.0	414.1	16624	458.7	.025	2.4	0.0	4.24	170.1	4.7
14	0.0	325.4	8070	658.6	.055	4.9	0.0	3.63	90.0	7.3
15	0.0	269.6	5587	693.8	.035	2.8	0.0	3.37	69.9	8.7
16	0.0	130.5	1818	921.2	.060	4.4	0.0	1.79	24.9	12.6
17	0.0	82.4	444	745.0	.060	2.9	0.0	1.69	9.1	15.2
18	0.0	66.7	424	317.8	0.000	0.0	0.0	2.76	17.6	13.2
19	0.0	48.1	353	196.3	.065	1.2	0.0	2.70	19.8	11.0
20	0.0	21.7	204	76.6	0.000	0.0	0.0	2.70	25.3	9.5
21	0.0	18.5	324	34.1	0.000	0.0	0.0	10.82	189.7	19.9
22	0.0	47.6	866	2.8	.080	0.0	I	R	R	R
23	0.0	952.9	527	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	7.457	GRAM/BHP HR
	CO	76.342	GRAM/BHP HR
	NO2	9.873	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.676	LB/BHP HR

TABLE E-24. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 5-OX TEST-19 RUN-1 1972 ENGINE-75 CARB. 05-17-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	18.4	4.8	17.2	0	2907	1.860	10.92	65
2	1200	5.0	1	21.0	6.2	15.0	0	3350	1.530	12.72	105
3	1200	18.0	4	20.2	6.8	15.0	0	3147	1.410	12.86	165
4	1200	39.0	9	18.8	8.5	15.0	0	3265	1.300	13.14	410
5	1200	55.0	13	17.4	9.5	15.1	0	3215	1.000	13.29	770
6	1200	109.0	25	12.5	14.0	15.9	0	2881	.140	13.43	2175
7	1200	161.0	37	6.8	18.8	15.1	0	2897	.650	13.58	1963
8	1200	176.0	40	5.1	19.3	15.2	0	3705	.440	13.58	2200
9	1200	198.0	45	3.6	23.9	13.7	0	3867	3.280	12.31	925
10	1200	215.0	49	.6	29.3	12.9	0	4026	4.470	11.79	710
11	750	0.0	0	18.6	4.1	17.2	0	2801	1.720	11.28	75
12	1200	0.0	0	22.2	4.3	17.3	0	13331	1.550	10.44	40
13	2300	224.0	98	1.4	59.7	11.9	0	3315	6.910	10.74	570
14	2300	206.0	90	2.8	51.0	12.9	0	2826	4.260	12.32	963
15	2300	184.0	81	4.1	42.6	14.0	0	2057	1.860	13.58	1850
16	2300	168.0	74	5.1	39.4	14.4	0	1573	1.460	13.66	1975
17	2300	113.0	49	11.5	27.7	14.5	0	2064	1.300	13.88	2250
18	2300	56.0	25	16.8	18.7	14.6	0	2120	1.360	13.73	1400
19	2300	41.0	18	18.3	16.7	14.6	0	1939	1.240	13.96	1025
20	2300	18.0	8	19.8	13.8	14.9	0	1592	.700	14.10	560
21	2300	4.0	2	21.0	11.9	14.7	0	2004	.980	14.03	305
22	750	0.0	0	18.9	4.7	17.4	0	2501	1.360	11.24	70
23	2300	0.0	0	24.8	4.6	17.1	0	44961	.980	5.55	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	48.4	626	3.6	.070	0.0	I	R	R	R
2	0.0	64.6	596	6.7	.060	.1	0.0	56.55	521.6	5.9
3	0.0	66.6	602	11.6	.060	.2	0.0	16.18	146.5	2.8
4	0.0	85.2	686	35.5	.050	.4	0.0	9.57	76.9	4.0
5	0.0	94.8	596	75.4	.030	.4	0.0	7.55	47.4	6.0
6	0.0	132.0	130	330.9	.060	1.5	0.0	5.30	5.2	13.3
7	0.0	170.1	771	382.8	0.000	0.0	0.0	4.63	21.0	10.4
8	0.0	225.4	541	444.3	.040	1.6	0.0	5.61	13.4	11.0
9	0.0	262.4	4496	208.4	0.000	0.0	0.0	5.80	99.4	4.6
10	0.0	321.2	7202	188.0	0.000	0.0	0.0	6.54	146.6	3.8
11	0.0	39.2	487	3.5	.070	0.0	I	R	R	R
12	0.0	195.2	458	1.9	.120	0.0	I	R	R	R
13	0.0	499.3	21021	285.0	.025	2.5	0.0	5.09	214.3	2.9
14	0.0	387.7	11805	438.6	.055	5.0	0.0	4.30	130.9	4.9
15	0.0	254.1	4640	758.6	.035	2.8	0.0	3.15	57.6	9.4
16	0.0	184.0	3450	767.1	.060	4.4	0.0	2.50	46.9	10.4
17	0.0	168.6	2144	610.0	.060	3.0	0.0	3.41	43.3	12.3
18	0.0	117.5	1523	257.7	0.000	0.0	0.0	4.79	62.1	10.5
19	0.0	95.4	1233	167.5	.065	1.2	0.0	5.31	68.6	9.3
20	0.0	66.6	592	77.8	0.000	0.0	0.0	8.45	75.1	9.9
21	0.0	71.1	703	35.9	0.000	0.0	0.0	40.61	401.0	20.5
22	0.0	41.5	456	3.9	.080	0.0	I	R	R	R
23	0.0	850.8	375	.9	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	8.073	GRAM/BHP HR
	CO	91.128	GRAM/BHP HR
	NO2	8.476	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.686	LB/BHP HR

TABLE E-25. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 5-OX TEST-19 RUN-2 1972 ENGINE-75 CARB. 05-17-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION			
								HC	CO	CO2	NO
1	750	0.0	0	18.6	4.3	17.3	0	2550	1.750	11.04	60
2	1200	5.0	1	21.1	6.0	15.1	0	3130	1.480	13.00	105
3	1200	17.0	4	20.4	6.8	15.1	0	2899	1.330	13.00	165
4	1200	42.0	10	18.6	8.6	15.2	0	2854	1.020	13.29	500
5	1200	54.0	12	17.6	9.8	15.2	0	3034	.970	13.29	700
6	1200	108.0	25	12.6	13.8	15.9	0	2634	.170	13.43	2187
7	1200	161.0	37	6.8	18.7	15.2	0	2693	.510	13.73	1975
8	1200	175.0	40	5.1	19.7	15.3	0	2557	.570	13.63	2125
9	1200	200.0	46	3.3	24.2	13.8	0	3476	2.920	12.59	1125
10	1200	215.0	49	.6	29.2	12.7	0	3708	4.980	11.42	555
11	750	0.0	0	18.6	4.0	17.0	0	2691	2.050	11.04	65
12	1200	0.0	0	22.2	4.4	17.1	0	12732	1.830	10.80	35
13	2300	227.0	99	1.4	59.7	11.9	0	3282	7.020	10.68	490
14	2300	205.0	90	3.0	51.3	13.0	0	2556	3.900	12.45	925
15	2300	184.0	81	4.2	42.7	14.1	0	1874	1.830	13.58	1787
16	2300	168.0	74	5.2	39.8	14.3	0	1735	1.720	13.58	1787
17	2300	113.0	49	11.4	28.4	14.4	0	2121	1.440	13.73	2200
18	2300	56.0	25	16.8	18.8	14.5	0	2325	1.540	13.58	1325
19	2300	41.0	18	18.1	17.0	14.6	0	2096	1.180	13.88	1025
20	2300	18.0	8	19.6	14.0	14.8	0	1822	.960	14.03	565
21	2300	4.0	2	20.9	11.6	14.8	0	1433	1.000	13.88	270
22	750	0.0	0	18.8	4.7	17.3	0	2303	1.550	11.20	60
23	2300	0.0	0	24.8	4.5	17.3	0	42893	1.160	5.51	10

MODE	CALCULATED GRAM/HR				WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR			
	ALDE.	HC	CO	NO2			ALDE.	HC	CO	NO2
1	0.0	38.1	529	3.0	.070	0.0	I	R	R	R
2	0.0	57.6	550	6.4	.060	.1	0.0	50.40	481.5	5.6
3	0.0	61.2	567	11.6	.060	.2	0.0	15.75	145.9	3.0
4	0.0	76.3	551	44.4	.050	.5	0.0	7.95	57.4	4.6
5	0.0	92.6	598	70.9	.030	.4	0.0	7.50	48.5	5.7
6	0.0	118.9	155	327.8	.060	1.5	0.0	4.82	6.3	13.3
7	0.0	157.5	602	383.3	0.000	0.0	0.0	4.28	16.4	10.4
8	0.0	158.1	712	436.1	.040	1.6	0.0	3.95	17.8	10.9
9	0.0	240.6	4083	258.5	0.000	0.0	0.0	5.27	89.4	5.7
10	0.0	292.9	7945	145.5	0.000	0.0	0.0	5.96	161.7	3.0
11	0.0	36.5	562	2.9	.070	0.0	I	R	R	R
12	0.0	182.8	531	1.7	.120	0.0	I	R	R	R
13	0.0	492.9	21300	244.4	.025	2.5	0.0	4.96	214.3	2.5
14	0.0	358.1	11040	430.3	.055	4.9	0.0	3.99	123.0	4.8
15	0.0	232.7	4590	736.7	.035	2.8	0.0	2.89	57.0	9.1
16	0.0	202.4	4054	692.2	.060	4.4	0.0	2.75	55.1	9.4
17	0.0	177.6	2436	611.7	.060	3.0	0.0	3.59	49.2	12.4
18	0.0	129.2	1728	244.3	0.000	0.0	0.0	5.27	70.5	10.0
19	0.0	105.9	1204	171.9	.065	1.2	0.0	5.90	67.0	9.6
20	0.0	76.3	812	78.5	0.000	0.0	0.0	9.67	103.0	10.0
21	0.0	50.2	707	31.4	0.000	0.0	0.0	28.66	403.9	17.9
22	0.0	37.8	514	3.3	.080	0.0	I	R	R	R
23	0.0	798.9	436	.6	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.607	GRAM/BHP HR
	CO	92.316	GRAM/BHP HR
	NO2	8.183	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.689	LB/BHP HR

TABLE E-26. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 5-OX TEST-19 RUN-3 1972 ENGINE-75 CARB. 05-17-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	18.6	4.3	17.1	0	3117	1.940	11.16	65
2	1200	4.0	1	21.2	6.0	15.0	0	3109	1.570	13.00	100
3	1200	17.0	4	20.4	6.9	15.0	0	3243	1.460	13.00	160
4	1200	41.0	9	18.8	8.4	15.0	0	3128	1.280	13.14	440
5	1200	55.0	13	17.6	9.0	15.2	0	3036	.950	13.43	815
6	1200	110.0	25	12.2	13.9	15.9	0	2770	.180	13.43	2162
7	1200	160.0	37	6.8	18.7	15.1	0	2853	.700	13.58	1888
8	1200	175.0	40	5.1	19.3	15.2	0	2740	.700	13.58	2125
9	1200	198.0	45	3.5	23.8	13.3	0	3764	4.160	11.79	680
10	1200	215.0	49	.6	29.7	12.6	0	3944	5.270	11.28	510
11	750	0.0	0	18.6	4.4	17.3	0	2528	1.660	11.16	70
12	1200	0.0	0	22.2	4.1	17.1	0	14995	1.530	10.44	40
13	2300	225.0	99	1.4	58.6	11.8	0	3196	7.200	10.80	520
14	2300	206.0	90	3.0	49.7	12.8	0	2657	4.580	12.18	850
15	2300	185.0	81	4.2	43.1	13.9	0	1833	2.170	13.58	1750
16	2300	167.0	73	5.5	40.3	14.3	0	1691	1.680	13.73	1787
17	2300	113.0	49	11.2	29.1	14.5	0	1849	1.240	14.03	2225
18	2300	55.0	24	16.7	18.8	14.6	0	2052	1.250	13.88	1463
19	2300	41.0	18	18.1	16.7	14.7	0	1892	1.090	14.03	1037
20	2300	18.0	8	19.6	13.2	14.9	0	1319	.660	14.18	515
21	2300	4.0	2	20.8	11.9	14.9	0	1252	.790	14.18	310
22	750	0.0	0	18.8	4.6	17.1	0	2355	1.860	11.28	65
23	2300	0.0	0	24.8	4.6	17.5	0	40411	1.270	5.59	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	45.3	570	3.1	.070	0.0	I	R	R	R
2	0.0	56.9	580	6.1	.060	.1	0.0	62.22	634.6	6.6
3	0.0	68.6	624	11.2	.060	.2	0.0	17.67	160.7	2.9
4	0.0	80.9	669	37.8	.050	.5	0.0	8.64	71.4	4.0
5	0.0	84.4	534	75.2	.030	.4	0.0	6.72	42.5	6.0
6	0.0	125.8	165	325.9	.060	1.5	0.0	5.00	6.6	13.0
7	0.0	166.1	823	365.0	0.000	0.0	0.0	4.54	22.5	10.0
8	0.0	164.8	851	424.4	.040	1.6	0.0	4.12	21.3	10.6
9	0.0	248.9	5557	149.3	0.000	0.0	0.0	5.50	122.8	3.3
10	0.0	313.5	8464	134.6	0.000	0.0	0.0	6.38	172.3	2.7
11	0.0	38.6	512	3.5	.070	0.0	I	R	R	R
12	0.0	207.0	427	1.8	.120	0.0	I	R	R	R
13	0.0	463.8	21103	250.5	.025	2.5	0.0	4.71	214.2	2.5
14	0.0	351.8	12250	373.7	.055	5.0	0.0	3.90	135.8	4.1
15	0.0	224.9	5378	712.9	.035	2.8	0.0	2.78	66.4	8.8
16	0.0	198.4	3982	696.1	.060	4.4	0.0	2.71	54.4	9.5
17	0.0	157.9	2139	630.9	.060	3.0	0.0	3.19	43.2	12.7
18	0.0	114.1	1404	270.1	0.000	0.0	0.0	4.74	58.3	11.2
19	0.0	93.6	1089	170.4	.065	1.2	0.0	5.21	60.7	9.5
20	0.0	52.8	533	68.4	0.000	0.0	0.0	6.69	67.6	8.7
21	0.0	44.8	571	36.8	0.000	0.0	0.0	25.56	325.8	21.0
22	0.0	36.7	586	3.4	.080	0.0	I	R	R	R
23	0.0	773.5	491	.6	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	7.582	GRAM/BHP HR
	CO	95.397	GRAM/BHP HR
	NO2	8.042	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.685	LB/BHP HR

TABLE E-27. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 5-1 TEST-20 RUN-1 EGR-AIR-CAT 05-18-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	18.4	5.1	20.2	0	253	.060	10.80	50
2	1200	5.0	1	20.8	6.3	21.4	0	164	.010	10.21	75
3	1200	17.0	4	20.0	7.2	20.7	0	154	.010	10.56	135
4	1200	39.0	9	18.5	8.5	19.5	0	155	.010	11.28	375
5	1200	52.0	12	17.5	9.4	18.9	0	144	.010	11.53	670
6	1200	104.0	24	12.6	13.0	18.0	0	145	.010	12.31	1787
7	1200	158.0	36	5.5	18.7	16.7	0	146	.010	13.43	1425
8	1200	172.0	39	4.4	20.0	16.5	0	135	.010	13.73	1713
9	1200	192.0	44	3.4	22.9	14.7	0	114	.010	15.63	570
10	1200	210.0	48	0.0	27.6	13.8	0	323	2.170	14.33	95
11	750	0.0	0	18.6	5.1	19.7	0	99	.010	10.80	60
12	1200	0.0	0	21.9	5.0	23.4	0	130	.010	9.02	40
13	2300	215.0	94	1.2	57.4	12.8	0	383	4.750	12.45	30
14	2300	198.0	87	2.2	49.6	13.7	0	219	2.450	13.88	35
15	2300	176.0	77	4.0	42.1	14.9	0	103	.040	15.13	720
16	2300	163.0	71	4.6	38.5	15.3	0	91	.060	14.49	1262
17	2300	106.0	46	7.0	30.0	15.7	0	90	.060	14.03	480
18	2300	54.0	24	13.9	18.8	17.7	0	78	.010	12.31	485
19	2300	39.0	17	16.2	16.6	18.4	0	78	.010	11.92	415
20	2300	17.0	7	18.5	13.8	19.6	0	77	.010	10.92	305
21	2300	4.0	2	19.6	12.4	20.6	0	66	.010	10.33	230
22	750	0.0	0	18.2	4.7	21.0	0	77	.010	10.10	60
23	2300	0.0	0	24.4	4.6	32.1	0	74	.010	6.37	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	5.4	26	3.5	.070	0.0	I	R	R	R
2	0.0	4.6	6	7.0	.060	.1	0.0	4.01	4.9	6.1
3	0.0	4.7	6	13.8	.060	.2	0.0	1.22	1.6	3.6
4	0.0	5.3	7	42.5	.050	.4	0.0	.59	.8	4.8
5	0.0	5.3	7	82.1	.030	.4	0.0	.45	.6	6.9
6	0.0	6.9	10	283.6	.060	1.4	0.0	.29	.4	11.9
7	0.0	9.2	13	298.3	0.000	0.0	0.0	.26	.4	8.3
8	0.0	8.9	13	375.1	.040	1.6	0.0	.23	.3	9.5
9	0.0	7.6	13	125.6	0.000	0.0	0.0	.17	.3	2.9
10	0.0	24.4	3319	23.9	0.000	0.0	0.0	.51	69.2	.5
11	0.0	2.1	4	4.3	.070	0.0	I	R	R	R
12	0.0	3.3	5	3.3	.120	0.0	I	R	R	R
13	0.0	57.8	14492	15.0	.025	2.4	0.0	.61	153.9	.2
14	0.0	30.1	6809	16.0	.055	4.8	0.0	.35	78.5	.2
15	0.0	12.9	102	300.7	.035	2.7	0.0	.17	1.3	3.9
16	0.0	10.9	145	502.6	.060	4.3	0.0	.15	2.0	7.0
17	0.0	8.7	117	153.8	.060	2.8	0.0	.19	2.5	3.3
18	0.0	5.4	14	111.4	0.000	0.0	0.0	.23	.6	4.7
19	0.0	4.9	13	86.9	.065	1.1	0.0	.29	.7	5.1
20	0.0	4.4	12	58.0	0.000	0.0	0.0	.59	1.6	7.8
21	0.0	3.6	11	41.5	0.000	0.0	0.0	2.04	6.3	23.7
22	0.0	1.6	4	4.2	.080	0.0	I	R	R	R
23	0.0	2.4	7	1.1	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.362	GRAM/BHP HR
	CO	34.515	GRAM/BHP HR
	NO2	4.344	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.719	LB/BHP HR

TABLE E-28. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 5-1   TEST-20   RUN-2   EGR-AIR-CAT   05-18-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	18.4	5.1	20.9	0	98	.060	10.10	55
2	1200	5.0	1	20.8	6.5	21.8	0	76	.010	9.66	85
3	1200	18.0	4	19.9	7.4	21.1	0	87	.010	9.99	155
4	1200	38.0	9	18.6	8.1	19.7	0	99	.010	10.68	315
5	1200	54.0	12	17.2	9.6	19.3	0	99	.010	11.04	730
6	1200	105.0	24	12.3	13.3	18.3	0	100	.010	11.79	1800
7	1200	158.0	36	5.4	18.6	16.8	0	101	.010	12.86	1488
8	1200	172.0	39	4.4	19.5	16.5	0	101	.010	13.14	1737
9	1200	190.0	43	3.8	22.2	15.7	0	85	.010	13.73	1637
10	1200	210.0	48	0.0	27.2	13.8	0	401	2.130	13.58	135
11	750	0.0	0	18.6	5.0	19.9	0	55	.010	10.33	60
12	1200	0.0	0	21.9	4.9	24.1	0	65	.100	8.72	30
13	2300	215.0	94	1.3	57.4	12.6	0	486	5.090	11.92	95
14	2300	198.0	87	2.6	48.8	13.8	0	195	2.130	13.88	85
15	2300	176.0	77	4.0	41.8	14.9	0	79	.010	14.49	1213
16	2300	161.0	71	4.9	37.8	15.5	0	79	.010	14.03	1463
17	2300	106.0	46	7.2	30.4	15.7	0	68	.010	13.73	515
18	2300	54.0	24	14.1	19.1	17.9	0	67	.010	12.05	500
19	2300	39.0	17	16.1	16.8	18.5	0	66	.010	11.66	445
20	2300	17.0	7	18.5	13.9	19.7	0	66	.010	10.80	320
21	2300	4.0	2	19.7	12.5	20.7	0	66	.010	10.10	240
22	750	0.0	0	18.4	4.6	20.7	0	77	.010	10.10	65
23	2300	0.0	0	24.4	4.5	32.1	0	85	.010	6.37	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	2.2	28	4.2	.070	0.0	I	R	R	R
2	0.0	2.3	6	8.6	.060	.1	0.0	2.03	5.4	7.5
3	0.0	2.9	7	17.3	.060	.2	0.0	.71	1.6	4.2
4	0.0	3.4	7	35.9	.050	.4	0.0	.39	.8	4.1
5	0.0	3.9	8	95.4	.030	.4	0.0	.32	.6	7.7
6	0.0	5.1	10	305.3	.060	1.4	0.0	.21	.4	12.7
7	0.0	6.6	13	323.6	0.000	0.0	0.0	.18	.4	9.0
8	0.0	6.8	14	387.6	.040	1.6	0.0	.17	.3	9.9
9	0.0	6.2	15	398.1	0.000	0.0	0.0	.14	.3	9.2
10	0.0	31.4	3370	35.1	0.000	0.0	0.0	.65	70.2	.7
11	0.0	1.2	4	4.4	.070	0.0	I	R	R	R
12	0.0	1.6	51	2.5	.120	0.0	I	R	R	R
13	0.0	74.2	15693	48.1	.025	2.4	0.0	.79	166.7	.5
14	0.0	27.0	5942	39.0	.055	4.8	0.0	.31	68.5	.4
15	0.0	10.4	26	526.3	.035	2.7	0.0	.13	.3	6.8
16	0.0	9.7	25	592.8	.060	4.2	0.0	.14	.3	8.4
17	0.0	6.8	20	171.5	.060	2.8	0.0	.15	.4	3.7
18	0.0	4.8	15	119.2	0.000	0.0	0.0	.20	.6	5.0
19	0.0	4.3	13	96.4	.065	1.1	0.0	.25	.8	5.6
20	0.0	3.8	12	61.9	0.000	0.0	0.0	.52	1.6	8.3
21	0.0	3.7	11	44.7	0.000	0.0	0.0	2.10	6.5	25.5
22	0.0	1.6	4	4.5	.080	0.0	I	R	R	R
23	0.0	2.7	6	1.1	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.311	GRAM/BHP HR
	CO	33.300	GRAM/BHP HR
	NO2	5.220	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.716	LB/BHP HR

TABLE E-29. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 5-1 TEST-20 RUN-3 EGR-AIR-CAT 05-18-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	18.2	5.1	22.8	0	109	.010	9.23	55
2	1200	4.0	1	20.8	6.3	21.9	0	87	.010	9.55	80
3	1200	18.0	4	19.8	7.1	21.2	0	98	.010	9.88	140
4	1200	39.0	9	18.4	8.6	19.8	0	110	.010	10.56	395
5	1200	54.0	12	17.3	9.5	19.4	0	110	.010	10.92	675
6	1200	105.0	24	12.1	13.4	18.4	0	111	.010	11.53	1663
7	1200	158.0	36	5.2	19.2	17.1	0	101	.010	12.72	1313
8	1200	172.0	39	4.2	20.0	16.6	0	112	.010	13.00	1713
9	1200	193.0	44	3.6	23.4	15.0	0	68	.010	14.65	670
10	1200	210.0	48	0.0	27.6	14.0	0	286	1.680	13.88	115
11	750	0.0	0	18.6	5.0	19.9	0	55	.010	10.44	60
12	1200	0.0	0	22.0	4.9	24.4	0	65	.010	8.62	30
13	2300	217.0	95	1.2	56.9	12.7	0	475	5.030	12.18	150
14	2300	198.0	87	2.6	47.8	13.8	0	184	2.050	13.88	115
15	2300	175.0	77	4.1	41.5	14.8	0	68	.020	14.65	1200
16	2300	163.0	71	4.8	38.5	15.5	0	68	.010	14.18	1463
17	2300	109.0	48	7.1	31.8	15.7	0	68	.010	13.88	513
18	2300	54.0	24	13.7	20.0	17.8	0	67	.010	12.31	475
19	2300	39.0	17	15.9	17.2	18.6	0	67	.010	11.79	455
20	2300	18.0	8	18.4	13.9	19.6	0	66	.010	10.92	345
21	2300	4.0	2	20.0	12.1	20.4	0	66	.010	10.33	220
22	750	0.0	0	18.4	4.7	21.0	0	87	.010	10.10	65
23	2300	0.0	0	24.4	4.6	32.1	0	85	.010	6.37	20

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	2.7	5	4.6	.070	0.0	I	R	R	R
2	0.0	2.6	6	7.9	.060	.1	0.0	2.85	6.6	8.7
3	0.0	3.2	7	15.1	.060	.2	0.0	.78	1.6	3.7
4	0.0	4.0	7	48.3	.050	.4	0.0	.45	.8	5.4
5	0.0	4.3	8	88.3	.030	.4	0.0	.35	.6	7.2
6	0.0	5.8	11	290.5	.060	1.4	0.0	.24	.4	12.1
7	0.0	6.9	14	298.0	0.000	0.0	0.0	.19	.4	8.3
8	0.0	7.8	14	396.2	.040	1.6	0.0	.20	.4	10.1
9	0.0	4.9	15	161.0	0.000	0.0	0.0	.11	.3	3.7
10	0.0	23.0	2725	30.7	0.000	0.0	0.0	.48	56.8	.6
11	0.0	1.2	4	4.3	.070	0.0	I	R	R	R
12	0.0	1.7	5	2.6	.120	0.0	I	R	R	R
13	0.0	71.1	15196	74.5	.025	2.4	0.0	.75	159.9	.8
14	0.0	25.0	5630	51.9	.055	4.8	0.0	.29	64.9	.6
15	0.0	8.7	52	511.0	.035	2.7	0.0	.11	.7	6.7
16	0.0	8.3	25	597.5	.060	4.3	0.0	.12	.3	8.4
17	0.0	7.0	21	176.8	.060	2.9	0.0	.15	.4	3.7
18	0.0	4.9	15	116.1	0.000	0.0	0.0	.21	.6	4.9
19	0.0	4.4	13	99.8	.065	1.1	0.0	.26	.8	5.8
20	0.0	3.8	12	66.0	0.000	0.0	0.0	.48	1.5	8.4
21	0.0	3.5	11	38.7	0.000	0.0	0.0	1.99	6.1	22.1
22	0.0	1.8	4	4.5	.080	0.0	I	R	R	R
23	0.0	2.8	7	2.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	.306	GRAM/BHP HR
	CO	31.493	GRAM/BHP HR
	NO2	5.254	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.716	LB/BHP HR

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                    TABLE E-30          VEHICLE EMISSION RESULTS
                                   1975  LIGHT DUTY EMISSIONS TEST

UNIT NO. 5-00          TEST NO. 3          DATE  8/30/73                  MFGR. CODE     5                YR. 1970
VEHICLE MODEL 400                          ENGINE 5-00   CID *            CURB WT.      5,650             GVW 16,500
                                                                          LA-4 DYNO TEST WEIGHT   11,200

BAROMETER  29.26 IN.HG.                                                   WET BULB TEMP  67.0 DEG. F
DRY BULB TEMP.    72.0 DEG. F                                              ABS. HUMIDITY  92.9 GRAINS/LB
REL. HUMIDITY      77 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                        1              2
     FINAL WT.,    GRAMS                          -0.00          -0.00
     INITIAL WT., GRAMS                           -0.00          -0.00
     DIFFERENCE    GRAMS                           0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                             0.00 GRAMS

EXHAUST EMISSIONS

                                                                          BLOWER INLET PRESS., G1  17.0 IN. H2O
     BLOWER DIF. PRESS., G2,  17.5 IN. H2O                                BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                         1              2              3
     BLOWER REVOLUTIONS                          90866          69996          90662
     HC   SAMPLE  METER READING/SCALE            11.9/4         43.2/3         62.9/3
     HC   SAMPLE  PPM                             1190            432            629
     HC   BACKGRD METER READING/SCALE             1.7/3           .7/3          2.9/3
     HC   BACKGRD PPM                               17              7             29
     CO   SAMPLE  METER READING/SCALE            60.9/1         82.8/2         55.2/1
     CO   SAMPLE  PPM                             6963           3373           5795
     CO   BACKGRD METER READING/SCALE              .9/2          1.0/2          1.0/2
     CO   BACKGRD PPM                               11             28             28
     CO2  SAMPLE  METER READING/SCALE            93.6/2         59.7/2         91.0/2
     CO2  SAMPLE  PERCENT                         3.00           1.73           2.89
     CO2  BACKGRD METER READING/SCALE             2.6/2          3.3/2          2.7/2
     CO2  BACKGRD PERCENT                          .06            .08            .07
     NOX  SAMPLE  METER READING/SCALE            61.6/3         28.2/3         67.9/3
     NOX  SAMPLE  PPM                            184.8           84.6          202.2
     NOX  BACKGRD METER READING/SCALE             0.0/3           .6/3           .5/3
     NOX  BACKGRD PPM                              0.0            1.8            1.5

     HC   CONCENTRATION PPM                       1178            426            603
     CO   CONCENTRATION PPM                       6379           3153           5307
     CO2  CONCENTRATION PCT                       2.95           1.66           2.84
     NOX  CONCENTRATION PPM                      184.8           83.1          201.1
     HC   MASS GRAMS                             53.50          33.16          27.29
     CO   MASS GRAMS                            585.13         495.33         489.39
     CO2  MASS GRAMS                           4275.99        4120.65        4096.48
     NOX  MASS GRAMS                             70.91          23.91          32.92

     WEIGHTED MASS HC      9.56 GRAMS/MILE
     WEIGHTED MASS CO    136.41 GRAMS/MILE
     WEIGHTED MASS CO2  1105.91 GRAMS/MILE
     WEIGHTED MASS NOX     7.37 GRAMS/MILE
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                    TABLE E-31            VEHICLE EMISSION RESULTS
                                    1975  LIGHT DUTY EMISSIONS TEST

UNIT NO.5-00         TEST NO. 4           DATE  8/31/73                 MFGR. CODE  5                     YR.  1970
VEHICLE MODEL 400                         ENGINE 5-00   CID *           CURB WT.    5,650                 GVW  16,500
                                                                        LA-4 DYNO TEST WEIGHT  11,200

BAROMETER  29.20 IN.HG.                                                 WET BULB TEMP  67.0 DEG. F
DRY BULB TEMP.   76.0 DEG. F                                             ABS. HUMIDITY  86.3 GRAINS/LB
REL. HUMIDITY     63 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                  1              2
     FINAL WT.,   GRAMS                    -0.00          -0.00
     INITIAL WT., GRAMS                    -0.00          -0.00
     DIFFERENCE   GRAMS                     0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                        0.00 GRAMS


EXHAUST EMISSIONS

                                                                 BLOWER INLET PRESS., G1  17.0 IN. H2O
     BLOWER DIF. PRESS., G2,  17.5 IN. H2O                       BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                   1              2              3
     BLOWER REVOLUTIONS                    40522          69994          40139
     HC   SAMPLE  METER READING/SCALE     18.7/4         40.3/3         65.8/3
     HC   SAMPLE  PPM                      1870           403            658
     HC   BACKGRD METER READING/SCALE      2.1/3          3.0/3          3.2/3
     HC   BACKGRD PPM                       21             30             32
     CO   SAMPLE  METER READING/SCALE     61.7/1         83.9/2         55.8/1
     CO   SAMPLE  PPM                      7144           3438           5909
     CO   BACKGRD METER READING/SCALE       .3/2          1.0/2          1.1/2
     CO   BACKGRD PPM                        8             28             31
     CO2  SAMPLE  METER READING/SCALE     94.1/2         58.5/2         87.9/2
     CO2  SAMPLE  PERCENT                  3.02           1.69           2.77
     CO2  BACKGRD METER READING/SCALE      2.9/2          2.3/2          2.4/2
     CO2  BACKGRD PERCENT                  .07            .06            .06
     NOX  SAMPLE  METER READING/SCALE     64.4/3         30.3/3         71.5/3
     NOX  SAMPLE  PPM                     193.2           90.9          214.5
     NOX  BACKGRD METER READING/SCALE       .1/3           .5/3           .7/3
     NOX  BACKGRD PPM                        .3            1.5            2.1

     HC   CONCENTRATION PPM                1855            378            634
     CO   CONCENTRATION PPM                6578           3233           5452
     CO2  CONCENTRATION PCT                2.97           1.64           2.72
     NOX  CONCENTRATION PPM               193.0           89.6          212.9
     HC   MASS GRAMS                      83.39          29.32          28.23
     CO   MASS GRAMS                     597.00         506.81         490.10
     CO2  MASS GRAMS                    4253.76        4063.68        3864.98
     NOX  MASS GRAMS                      30.39          24.38          33.22

     WEIGHTED MASS HC      10.84 GRAMS/MILE
     WEIGHTED MASS CO     139.05 GRAMS/MILE
     WEIGHTED MASS CO2  1079.44 GRAMS/MILE
     WEIGHTED MASS NOX     7.52 GRAMS/MILE
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                         TABLE  E-32           VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST

UNIT NO.  5-1        TEST NO. 5            DATE  9/ 4/73                     MFGR. CODE  5                      YR.  1970
VEHICLE MODEL                              ENGINE 5-1    CID *               CURB WT.     5,650                 GVW  16,500
                                                                             LA-4 DYNO TEST WEIGHT 11,200

BAROMETER  29.10 IN.HG.                                                     WET BULB TEMP  69.0 DEG. F
DRY BULB TEMP.   76.0 DEG. F                                                 ABS. HUMIDITY  97.5 GRAINS/LB
REL. HUMIDITY     71 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                         1               2
     FINAL WT.,   GRAMS                           -0.00           -0.00
     INITIAL WT., GRAMS                           -0.00           -0.00
     DIFFERENCE   GRAMS                            0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                                0.00 GRAMS


EXHAUST EMISSIONS

                                                                            BLOWER INLET PRESS., G1  17.0 IN. H2O
     BLOWER DIF. PRESS., G2,  17.5 IN. H2O                                  BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                          1               2               3
     BLOWER REVOLUTIONS                           40762           70015           40581
     HC    SAMPLE  METER READING/SCALE            11.3/4           4.7/3          12.4/3
     HC    SAMPLE  PPM                            1130              47             124
     HC    BACKGRD METER READING/SCALE             2.0/3            .4/4           2.9/3
     HC    BACKGRD PPM                              20              40              29
     CO    SAMPLE  METER READING/SCALE            61.1/1          20.0/2          70.1/2
     CO    SAMPLE  PPM                            7008             609            2672
     CO    BACKGRD METER READING/SCALE             1.4/2           1.1/2            .6/2
     CO    BACKGRD PPM                              40              31              17
     CO2   SAMPLE  METER READING/SCALE            96.9/2          64.9/2          96.9/2
     CO2   SAMPLE  PERCENT                        3.14            1.91            3.14
     CO2   BACKGRD METER READING/SCALE             2.5/2           2.3/2           2.3/2
     CO2   BACKGRD PERCENT                         .06             .06             .06
     NOX   SAMPLE  METER READING/SCALE            40.4/3          22.2/3          47.8/3
     NOX   SAMPLE  PPM                           121.2            66.6           143.4
     NOX   BACKGRD METER READING/SCALE              .6/3            .3/3            .6/3
     NOX   BACKGRD PPM                             1.8              .9             1.8

     HC    CONCENTRATION PPM                      1116              13             102
     CO    CONCENTRATION PPM                      6398             546            2438
     CO2   CONCENTRATION PCT                      3.09            1.86            3.09
     NOX   CONCENTRATION PPM                     119.9            65.8           142.1
     HC    MASS GRAMS                            50.27            1.00            4.59
     CO    MASS GRAMS                           582.00           85.37          220.77
     CO2   MASS GRAMS                          4442.41         4590.11         4424.73
     NOX   MASS GRAMS                            20.04           18.89           23.63

     WEIGHTED MASS HC       3.36 GRAMS/MILE
     WEIGHTED MASS CO      61.53 GRAMS/MILE
     WEIGHTED MASS CO2   1202.99 GRAMS/MILE
     WEIGHTED MASS NOX      5.46 GRAMS/MILE
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                    TABLE  E-33          VEHICLE EMISSION RESULTS
                                      1975  LIGHT DUTY EMISSIONS TEST

UNIT NO.     5-1        TEST NO. 8          DATE  9/ 7/73                     MFGR. CODE   5                   YR.   1970
VEHICLE MODEL                               ENGINE 5-1   CID *                CURB WT.       5,650             GVW   16,500
                                                                              LA-4 DYNO TEST WEIGHT   11,200

BAROMETER  29.02 IN.HG.                                                       WET BULB TEMP  64.0 DEG. F
DRY BULB TEMP.    68.0 DEG. F                                                  ABS. HUMIDITY  85.2 GRAINS/LB
REL. HUMIDITY      81 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                       1              2
     FINAL WT.,    GRAMS                        -0.00          -0.00
     INITIAL WT., GRAMS                         -0.00          -0.00
     DIFFERENCE    GRAMS                         0.00           0.00

     TOTAL EVAPORATIVE EMISSIONS                                          0.00 GRAMS

EXHAUST EMISSIONS

                                                                      BLOWER INLET PRESS., G1  17.0 IN. H2O
     BLOWER DIF. PRESS., G2,  17.5 IN. H2O                             BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                        1              2              3
     BLOWER REVOLUTIONS                         40915          70109          40365
     HC    SAMPLE  METER READING/SCALE         10.1/4          4.9/3          7.8/3
     HC    SAMPLE  PPM                          1010             49             78
     HC    BACKGRD METER READING/SCALE           .5/3          3.1/3          2.5/3
     HC    BACKGRD PPM                             5             31             25
     CO    SAMPLE  METER READING/SCALE         63.9/1         22.0/2         66.7/2
     CO    SAMPLE  PPM                          7666            675           2500
     CO    BACKGRD METER READING/SCALE           .7/2           .8/2           .7/2
     CO    BACKGRD PPM                            20             23             20
     CO2   SAMPLE  METER READING/SCALE         35.0/1         70.9/2         95.2/2
     CO2   SAMPLE  PERCENT                      3.40           2.12           3.07
     CO2   BACKGRD METER READING/SCALE          2.2/2          2.3/2          2.3/2
     CO2   BACKGRD PERCENT                       .05            .06            .06
     NOX   SAMPLE  METER READING/SCALE         35.4/3         20.9/3         44.2/3
     NOX   SAMPLE  PPM                         106.2           62.7          132.6
     NOX   BACKGRD METER READING/SCALE           .2/3           .3/3           .4/3
     NOX   BACKGRD PPM                            .6             .9            1.2

     HC    CONCENTRATION PPM                    1007             23             59
     CO    CONCENTRATION PPM                    6950            611           2273
     CO2   CONCENTRATION PCT                    3.37           2.07           3.02
     NOX   CONCENTRATION PPM                   105.8           61.9          131.7
     HC    MASS GRAMS                          44.84           1.78           2.63
     CO    MASS GRAMS                         625.08          95.35         204.13
     CO2   MASS GRAMS                        4780.06        5109.30        4286.72
     NOX   MASS GRAMS                          16.41          16.67          20.41

     WEIGHTED MASS HC       3.01 GRAMS/MILE
     WEIGHTED MASS CO      64.06 GRAMS/MILE
     WEIGHTED MASS CO2   1281.09 GRAMS/MILE
     WEIGHTED MASS NOX      4.72 GRAMS/MILE
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APPENDIX F

TASK 6 - ENGINE 6

MASS EMISSION RESULTS BY:
NINE-MODE FTP
NINE-MODE EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY
1975 LIGHT DUTY FTP

TABLE F-1. NINE MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 6

			Composite Emissions, Grams/Bhp Hr					
			HC		CO	NO2		Cycle BSFC
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Lbs/Bhp Hr
51	2	1973 Standard Baseline	4.26	6.95	63.90	9.86	9.37	0.771
51	3	1973 Standard Baseline	4.08	6.45	62.84	10.05	9.65	0.771
		Average	4.17	6.70	63.37	9.96	9.51	0.771
55	1	Parametric Baseline, 7-25-73	5.59	7.03	42.78	9.06	8.70	0.932
55	2	Parametric Baseline, 7-25-73	5.41	6.76	40.30	9.57	8.97	0.932
55	3	Parametric Baseline, 7-25-73	5.29	6.80	39.29	10.62	10.03	0.932
		Average	5.43	6.86	40.79	9.75	9.23	0.932
58	3	Parametric Baseline, 7-30-73	5.03	7.18	44.64	11.25	10.68	0.912
63	2	Parametric Baseline, 8-6-73	5.11	7.22	41.38	8.45	8.24	0.897
79	2	Parametric Baseline, 8-24-73	4.52	6.34	39.59	10.84	10.39	0.902
79	5	Parametric Baseline, 8-24-73	5.08	6.49	40.34	11.63	11.44	0.902
		Average	4.80	6.42	39.97	11.24	10.92	0.902
56	2	Timing, 12 BTDC	5.44	7.13	37.07	11.15	10.53	0.866
56	1	Timing, TDC	4.73	6.13	33.84	9.51	8.92	1.095
56	3	Timing, 6 ATDC	1.83	1.33	26.56	8.91	6.76	1.726
57	8	Carb Jets 58	5.20	6.62	24.79	8.63	8.07	0.957
57	5	Carb Jets 59	5.23	7.18	23.67	10.27	9.86	0.977
57	2	Carb Jets 61	4.99	6.82	53.36	10.06	9.68	0.882
57	6	Carb Jets 63	4.59	7.22	58.55	9.63	9.07	0.861
57	3	Carb Jets 64	4.93	8.87	127.97	7.97	6.62	0.864
58	2	Air Injection except at CT	5.26	6.16	21.55	11.92	10.66	0.929
58	4	Air Injection	5.44	5.47	20.43	11.89	11.56	0.921
59	1	Decel Modulator	1.24	2.68	45.28	11.15	10.87	0.933

TABLE F-1 (Cont'd). NINE MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 6

Test	Run	Engine Configuration*	Composite Emissions, Grams/Bhp Hr					Cycle BSFC Lbs/Bhp Hr
			HC		CO	NO_2		
			NDIR	FID	NDIR	NDIR	CL	
64	1	EGR (4-1) 5	5.66	7.82	37.44	8.56	8.22	1.075
64	2	EGR (4-1) 10	6.74	8.55	39.50	8.61	8.08	1.088
64	3	EGR (4-1) 15	6.45	8.71	53.20	8.07	7.21	1.592
64	4	EGR (2-1)	6.23	8.09	31.22	7.48	7.12	1.128
64	5	EGR (2-1), 63 Jets	5.30	8.76	95.37	7.36	6.37	0.967
64	X	EGR (simulated), 63 Jets	6.34	10.00	109.06	6.25	5.87	1.074
74	1	O-Cat, Air, EGR(4-1) 10, 63 Jets	1.38	0.08	4.20	6.71	6.55	1.108
74	2	O-Cat, Air, EGR(4-1) 10, 63 Jets	1.34	0.03	6.15	6.98	6.53	1.108
		Average	1.36	0.06	5.18	6.85	6.54	1.108
75	1	O-Cat, Air, EGR(4-1) 10	1.33	0.10	8.56	10.33	8.75	1.250
75	2	O-Cat, Air, EGR(4-1) 10	1.71	0.12	5.01	9.48	8.86	1.250
		Average	1.52	0.11	6.79	9.91	8.81	1.250
60	2	O-Cat, Air, Decel	0.80	0.07	4.47	11.11	11.13	0.958
60	3	O-Cat, Decel	0.85	0.68	19.93	7.78	7.51	0.943
60	4	O-Cat, Air, Decel, TDC	0.93	0.03	6.24	9.73	9.35	1.184
60	5	O-Cat, Air, Decel, TDC, 59 Jets	0.96	0.05	7.09	10.10	9.71	1.247
61	1	R&O Cat, Air, 64 Jets	0.74	0.27	1.82	0.39	0.22	0.933
61	2	R&O Cat, Air, 64 Jets	0.66	0.35	3.72	0.36	0.20	0.933
61	3	R&O Cat, Air, 64 Jets	0.71	0.33	3.63	0.33	0.19	0.933
		Average	0.70	0.32	3.06	0.36	0.20	0.933
62	1	R&O Cat, No Air to R, Decel, 64 Jets	0.32	0.40	3.83	2.24	1.36	0.934

*Engine 6-00, 1973 Standard Baseline as in Test 51.
Engine 6-0P, Parametric Baseline as in Tests 55, 58, 63, and 79.
Engine 6-0P, Parametric Baseline Configuration as in Tests 56, 57, 58, 59, 60, 62, 64, 74, and 75.
Engine 6-1P, Best Combination Configuration as in Test 61.

TABLE F-2. NINE MODE EPA COMPOSITE EMISSIONS SUMMARY FOR ENGINE 6

Test	Run	Engine Configuration*	Composite Emissions, Grams/Bhp Hr					Cycle BSFC Lbs/Bhp Hr
			HC		CO	NO2		
			NDIR	FID	NDIR	NDIR	CL	
52	1	1973 Standard Baseline	3.69	5.92	67.49	10.15	9.35	0.681
52	2	1973 Standard Baseline	3.59	5.64	78.45	8.82	8.56	0.681
52	3	1973 Standard Baseline	3.91	5.69	78.50	9.06	8.74	0.681
		Average	3.73	5.75	74.81	9.34	8.88	0.681
66	4	Parametric Baseline, 8-9-73	3.16	4.76	31.68	11.33	10.72	0.742
66	5	Parametric Baseline, 8-9-73	3.78	4.58	32.07	11.17	10.90	0.742
		Average	3.47	4.67	31.88	11.25	10.81	0.742
65	2	EGR (4-1) 5	3.38	5.31	45.71	8.48	8.02	0.780
65	1	EGR (4-1) 10	3.17	4.54	30.59	6.55	6.11	0.770
65	3	EGR (4-1) 15	3.80	4.16	46.50	5.17	4.74	0.786
65	4	EGR (2-1)	3.70	5.51	42.89	8.40	8.02	0.783
65	Y	EGR (simulated)	3.31	5.56	65.17	5.35	5.05	0.783
76	1	O-Cat, Air, EGR(4-1) 10	1.19	0.26	3.34	7.03	6.80	0.767
76	2	O-Cat, Air, EGR(4-1) 10	1.13	0.25	4.41	7.50	7.20	0.767
		Average	1.16	0.26	3.88	7.27	7.00	0.767
68	1	R&O Cat, Air, 64 Jets	0.74	0.23	2.69	0.36	0.23	0.814
68	2	R&O Cat, Air, 64 Jets	0.81	0.26	2.10	0.59	0.28	0.814
68	3	R&O Cat, Air, 64 Jets	0.70	0.27	3.25	0.50	0.23	0.814
		Average	0.75	0.25	2.68	0.48	0.25	0.814

*Engine 6-00, 1973 Standard Baseline
Engine 6-0P, Parametric Baseline as in Test 66.
Engine 6-0P, Parametric Configuration as in Tests 65 and 76.
Engine 6-1P, Best Combination Configuration as in Test 68.

TABLE F-3. 23-MODE COMPOSITE EMISSIONS SUMMARY FOR ENGINE 6

			Composite Emissions, Grams/Bhp Hr					
			HC		CO	NO_2		
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Cycle BSFC Lbs/Bhp Hr
53	1	1973 Standard Baseline	----	4.68	76.75	----	8.05	0.716
53	2	1973 Standard Baseline	----	4.50	82.21	----	7.96	0.709
53	3	1973 Standard Baseline	----	4.35	76.20	----	7.98	0.710
		Average		4.51	78.39		8.00	0.712
78	1	Parametric Baseline, 8-22-73	----	6.11	68.51	----	9.74	0.734
78	2	Parametric Baseline, 8-22-73	----	6.53	70.86	----	10.03	0.734
78	3	Parametric Baseline, 8-22-73	----	6.33	65.82	----	9.65	0.738
		Average		6.32	68.40		9.81	0.735
77	1	O-Cat, Air, EGR(4-1) 10	----	0.21	27.05	----	6.15	0.780
77	2	O-Cat, Air, EGR(4-1) 10	----	0.19	21.56	----	7.66	0.781
		Average		0.20	24.31		6.91	0.781
67	1	R&O Cat, Air, 64 Jets	----	0.54	34.81	----	0.34	0.831
67	2	R&O Cat, Air, 64 Jets	----	0.53	34.75	----	0.35	0.829
67	3	R&O Cat, Air, 64 Jets	----	0.54	34.02	----	0.38	0.835
		Average		0.54	34.53		0.36	0.832

*Engine 6-00, 1973 Standard Baseline as in Test 53.
Engine 6-0P, Parametric Baseline as in Test 78.
Engine 6-0P, Parametric Configuration as in Test 77.
Engine 6-1P, Best Combination Configuration as in Test 67.

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                 TABLE F-4 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-00  TEST-51  RUN-2   1973 STANDARD ENGINE  07-16-73       K =1.110      HUM =131.0  GR/LB
-----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR               MAN.
MODE          HC      CO     CO2      NO   CARBON    CONS.      HC      CO      NO2   FACT.   HC        CO     NO2     HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE        47    .730   12.81     113   13.591     3221      12     349       9    .232    2.8       81     2.1      0     16.0
2 16 MG       61   1.650   12.97     471   14.686    10433      47    2368     111    .077    3.6      182     8.6     24     16.0
3 10 MG       68   1.010   13.28    1476   14.363    15695      80    2229     535    .147   11.8      328    78.7     60     10.0
4 16 MG       51   1.390   13.23     469   14.675    10433      39    1996     111    .077    3.0      154     8.5     24     16.0
5 19 MG       48   1.550   13.16     206   14.762     7348      26    1559      34    .057    1.5       89     1.9      5     19.0
6 16 MG       61   1.600   13.10     468   14.766    10433      47    2284     110    .077    3.6      176     8.5     24     16.0
7  3 MG       53   1.110   12.90    2109   14.067    22635      92    3608    1127    .113   10.4      408   127.3    100      3.0
8 16 MG       62   1.690   13.09     466   14.847    10433      47    2399     109    .077    3.6      185     8.4     24     16.0
9 C.T.      1952   1.670    9.69      97   13.468     3311     518     829       8    .143   74.1      119     1.1      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    9.1       62     8.8
1 IDLE        47    .730   12.81     113   13.591     3221      12     349       9    .232    2.8       81     2.1      0     16.0
2 16 MG       65   1.560   13.04     441   14.670    10433      50    2241     104    .077    3.8      173     8.0     24     16.0
3 10 MG       72   1.090   13.21    1436   14.378    15695      85    2404     520    .147   12.5      353    76.5     60     10.0
4 16 MG       64   1.610   13.08     440   14.759    10433      49    2299     103    .077    3.8      177     8.0     24     16.0
5 19 MG       54   1.990   12.96     189   14.958     7348      29    1926      31    .057    1.6      110     1.8      5     19.0
6 16 MG       66   1.760   12.95     451   14.781    10433      50    2509     106    .077    3.9      193     8.1     24     16.0
7  3 MG       56   1.110   12.94    2149   14.110    22635      97    3597    1144    .113   11.0      406   129.3    100      3.0
8 16 MG       64   1.800   13.06     429   14.929    10433      48    2541     100    .077    3.7      196     7.7     24     16.0
9 C.T.      2017   1.610    9.81      99   13.598     3311     530     792       8    .143   75.8      113     1.1      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    9.3       65     8.7
1 IDLE        56    .660   13.09     128   13.810     3221      14     311      10    .232    3.3       72     2.3      0     16.0
2 16 MG       67   1.640   13.04     459   14.752    10433      51    2343     108    .077    3.9      180     8.3     24     16.0
3 10 MG       72   1.140   13.21    1429   14.428    15695      85    2505     516    .147   12.4      368    75.9     60     10.0
4 16 MG       65   1.700   12.98     448   14.750    10433      50    2429     105    .077    3.8      187     8.1     24     16.0
5 19 MG       53   1.900   12.99     191   14.997     7348      28    1887      31    .057    1.6      108     1.8      5     19.0
6 16 MG       62   1.630   13.00     465   14.697    10433      48    2337     110    .077    3.7      180     8.4     24     16.0
7  3 MG       53   1.040   12.92    2176   14.017    22635      92    3392    1167    .113   10.4      383   131.8    100      3.0
8 16 MG       64   1.780   13.06     469   14.909    10433      48    2516     109    .077    3.7      194     8.4     24     16.0
9 C.T.      2034   1.630    9.83      98   13.557     3311     537     765       8    .143   76.7      108     1.1      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    9.3       64     8.9
1 IDLE        56    .660   13.09     128   13.810     3221      14     311      10    .232    3.3       72     2.3      0     16.0
2 16 MG       66   1.680   13.02     451   14.771    10433      50    2397     106    .077    3.9      185     8.1     24     16.0
3 10 MG       70   1.100   13.27    1478   14.496    15695      82    2414     533    .147   12.1      355    78.4     60     10.0
4 16 MG       63   1.680   13.05     470   14.798    10433      48    2393     110    .077    3.7      184     8.5     24     16.0
5 19 MG       53   1.840   13.04     195   14.937     7348      28    1828      32    .057    1.6      104     1.8      5     19.0
6 16 MG       63   1.720   12.98     466   14.768    10433      48    2455     109    .077    3.7      189     8.4     24     16.0
7  3 MG       54   1.050   12.91    2216   14.018    22635      94    3425    1188    .113   10.6      387   134.2    100      3.0
8 16 MG       66   1.860   12.98     454   14.911    10433      50    2629     105    .077    3.8      202     8.1     24     16.0
9 C.T.      2020   1.550    9.81     110   13.548     3311     533     766       9    .143   76.3      109     1.3      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    9.3       64     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------    9.2       63     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------    9.3       64     8.9
FOUR CYCLE COMPOSITE -                     HC- NDIR 0.35(      9.2) + 0.65(      9.3) =     9.259    GM/BHP HR
                                           CO- NDIR 0.35(     63.4) + 0.65(     64.2) =    63.898    GM/BHP HR
                                           NO2-NDIR 0.35(      8.8) + 0.65(      8.9) =     8.884    GM/BHP HR
                                                                    CORRECTED NO2 =     9.859    GM/BHP HR
                                                                             BSFC =      .771    LB/BHP HR


-----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR               MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO      NO2   FACT.  HC-FID     CO   NO2-CL    HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE      1080    .730   12.81      75   13.648     3221      25     348       6    .232    5.9       81     1.4      0     16.0
2 16 MG     1745   1.650   12.97     412   14.794    10433     123    2350      96    .077    9.5      181     7.4     24     16.0
3 10 MG     1740   1.010   13.28    1400   14.464    15695     189    2214     504    .147   27.8      325    74.1     60     10.0
4 16 MG     1887   1.390   13.23     412   14.809    10433     133    1978      96    .077   10.2      152     7.4     24     16.0
5 19 MG     1349   1.550   13.16     150   14.848     7348      67    1550      25    .057    3.8       88     1.4      5     19.0
6 16 MG     1774   1.600   13.10     400   14.877    10433     124    2266      93    .077    9.6      175     7.2     24     16.0
7  3 MG     1101   1.110   12.90    2000   14.120    22635     177    3594    1064    .113   20.0      406   120.3    100      3.0
8 16 MG     1747   1.690   13.09     400   14.955    10433     122    2382      93    .077    9.4      183     7.1     24     16.0
9 C.T.     27185   1.670    9.69      38   14.078     3311     639     793       3    .143   91.4      113      .4      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    6.7       61     8.2
1 IDLE      1080    .730   12.81      75   13.648     3221      25     348       6    .232    5.9       81     1.4      0     16.0
2 16 MG     1958   1.560   13.04     387   14.796    10433     138    2222      91    .077   10.6      171     7.0     24     16.0
3 10 MG     1967   1.090   13.21    1362   14.497    15695     213    2384     490    .147   31.3      350    72.0     60     10.0
4 16 MG     1846   1.610   13.08     400   14.875    10433     129    2281      93    .077   10.0      176     7.2     24     16.0
5 19 MG     1565   1.990   12.96     137   15.056     7348      76    1912      22    .057    4.4      109     1.3      5     19.0
6 16 MG     1875   1.760   12.95     400   14.997    10433     131    2490      93    .077   10.1      192     7.2     24     16.0
7  3 MG     1186   1.110   12.94    2162   14.169    22635     190    3588    1147    .113   21.4      405   129.6    100      3.0
8 16 MG     1820   1.800   13.06     387   15.092    10433     126    2582      89    .077    9.7      199     6.9     24     16.0
9 C.T.     26977   1.610    9.81      38   14.118     3311     633     763       3    .143   90.5      109      .4      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    7.0       64     8.4
1 IDLE      1381    .660   13.09      75   13.888     3221      32     309       6    .232    7.4       72     1.3      0     16.0
2 16 MG     1988   1.640   13.04     400   14.874    10433     139    2323      93    .077   10.7      179     7.2     24     16.0
3 10 MG     1897   1.140   13.21    1387   14.540    15695     205    2486     497    .147   30.1      365    73.1     60     10.0
4 16 MG     1916   1.700   12.98     387   14.872    10433     134    2409      90    .077   10.4      185     6.9     24     16.0
5 19 MG     1564   1.900   12.99     150   15.046     7348      76    1874      24    .057    4.4      107     1.4      5     19.0
6 16 MG     1859   1.630   13.00     400   14.816    10433     131    2319      94    .077   10.1      179     7.2     24     16.0
7  3 MG     1124   1.040   12.92    2150   14.073    22635     182    3379    1148    .113   20.5      382   129.7    100      3.0
8 16 MG     1890   1.780   13.06     412   15.024    10433     131    2496      95    .077   10.1      192     7.3     24     16.0
9 C.T.     27185   1.530    9.83      38   14.078     3311     639     727       3    .143   91.4      104      .4      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    7.0       63     8.4
1 IDLE      1381    .660   13.09      75   13.888     3221      32     309       6    .232    7.4       72     1.3      0     16.0
2 16 MG     2130   1.680   13.02     387   14.913    10433     149    2374      90    .077   11.5      183     6.9     24     16.0
3 10 MG     1911   1.100   13.27    1425   14.561    15695     206    2395     510    .147   30.3      352    75.0     60     10.0
4 16 MG     1790   1.680   13.05     412   14.909    10433     125    2375      96    .077    9.6      183     7.4     24     16.0
5 19 MG     1593   1.840   13.04     150   15.034     7348      78    1816      24    .057    4.4      104     1.4      5     19.0
6 16 MG     1888   1.720   12.98     400   14.889    10433     132    2435      93    .077   10.2      187     7.2     24     16.0
7  3 MG     1187   1.050   12.91    2225   14.076    22635     186    3411    1188    .113   21.0      385   134.2    100      3.0
8 16 MG     1890   1.860   12.98     375   15.024    10433     131    2608      86    .077   10.1      201     6.7     24     16.0
9 C.T.     26522   1.550    9.81      38   14.012     3311     627     740       3    .143   89.6      106      .4      0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------    7.0       64     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------    6.9       63     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------    7.0       64     8.5
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(      6.9) + 0.65(      7.0) =     6.953    GM/BHP HR
                                           CO- NDIR 0.35(     62.9) + 0.65(     63.6) =    63.392    GM/BHP HR
                                           NO2-CL   0.35(      8.3) + 0.65(      8.5) =     8.447    GM/BHP HR
                                                                    CORRECTED NO2 =     9.375    GM/BHP HR
                                                                             BSFC =      .771    LB/BHP HR
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                         TABLE  F-5 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-00  TEST-61  RUN-3   1973 STANDARD ENGINE  07-16-73      K =1.106     HUM =126.1  GR/LB
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             CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR             MAN.
MODE          HC      CO     CO2     NO   CARBON   CONS.      HC      CO     NO2   FACT.   HC       CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE        92    .950   12.92    103   13.915    3221      11     218       8   .232    2.5      51     1.9     0   16.0
2 16 MG       57   1.550   13.08    454   14.692   10933      44    2223     107   .077    3.4     171     8.2    24   16.0
3 10 MG       64   1.000   13.29   1557   14.309   15695      76    2216     567   .147   11.2     326    83.3    60   10.0
4 16 MG       54   1.500   13.12    467   14.678   10933      41    2154     110   .077    3.2     166     8.5    24   16.0
5 19 MG       46   1.850   13.05    191   14.950    7348      24    1837      31   .057    1.4     105     1.8     5   19.0
6 16 MG       58   1.710   13.03    482   14.803   10933      44    2435     113   .077    3.4     187     8.7    24   16.0
7  3 MG       47   1.070   12.85   2080   13.971   22635      82    3502    1119   .113    9.3     396   126.4   100    3.0
8 16 MG       54   1.830   12.96    484   14.854   10933      45    2596     113   .077    3.4     200     8.7    24   16.0
9 C.T.      1972   1.570    9.76     86   13.960    3311     524     780       7   .143   74.9     112     1.0     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.1      62     8.9
1 IDLE        92    .950   12.92    103   13.915    3221      11     218       8   .232    2.5      51     1.9     0   16.0
2 16 MG       67   1.670   13.04    466   14.782   10933      51    2381     109   .077    3.9     183     8.4    24   16.0
3 10 MG       69   1.040   13.22   1552   14.335   15695      82    2300     564   .147   12.0     338    82.9    60   10.0
4 16 MG       62   1.810   13.03    419   14.907   10933      47    2554      97   .077    3.6     197     7.5    24   16.0
5 19 MG       61   1.940   12.88    183   14.875    7348      27    1936      30   .057    1.6     110     1.7     5   19.0
6 16 MG       61   1.720   13.01    478   14.796   10933      46    2450     112   .077    3.6     189     8.6    24   16.0
7  3 MG       50   1.030   12.96   2151   14.044   22635      87    3353    1151   .113    9.8     379   130.1   100    3.0
8 16 MG       62   1.850   12.92    476   14.837   10933      47    2628     111   .077    3.6     202     8.6    24   16.0
9 C.T.      1792   1.540    9.87     81   13.891    3311     469     775       7   .143   67.0     111     1.0     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.9      63     9.0
1 IDLE        93    .600   13.02    110   13.720    3221      24     285       9   .232    5.5      66     2.0     0   16.0
2 16 MG       67   1.690   13.02    433   14.782   10933      51    2409     101   .077    3.9     186     7.8    24   16.0
3 10 MG       73   1.080   13.20   1514   14.359   15695      86    2385     544   .147   12.7     351    80.0    60   10.0
4 16 MG       64   1.780   13.04    428   14.934   10933      48    2511      99   .077    3.7     193     7.6    24   16.0
5 19 MG       52   1.870   12.99    182   14.916    7348      28    1861      30   .057    1.6     106     1.7     5   19.0
6 16 MG       63   1.750   13.04    464   14.858   10933      48    2482     109   .077    3.7     191     8.4    24   16.0
7  3 MG       52   1.020   12.99   2212   14.066   22635      90    3316    1182   .113   10.2     375   133.5   100    3.0
8 16 MG       63   1.860   12.98    442   14.908   10933      48    2629     103   .077    3.7     202     7.9    24   16.0
9 C.T.      1909   1.560    9.82     85   13.992    3311     508     776       7   .143   72.6     111     1.0     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.2      64     9.0
1 IDLE        93    .600   13.02    110   13.720    3221      24     285       9   .232    5.5      66     2.0     0   16.0
2 16 MG       69   1.720   12.97    475   14.765   10933      53    2455     111   .077    4.1     189     8.6    24   16.0
3 10 MG       71   1.000   13.26   1578   14.337   15695      84    2211     574   .147   12.3     325    84.3    60   10.0
4 16 MG       67   1.750   13.00    477   14.822   10933      51    2488     111   .077    3.9     192     8.6    24   16.0
5 19 MG       53   1.630   13.11    193   14.797    7348      28    1636      32   .057    1.6      93     1.8     5   19.0
6 16 MG       69   1.620   13.10    505   14.789   10933      49    2309     118   .077    3.8     178     9.1    24   16.0
7  3 MG       56   1.050   12.99   2222   14.100   22635      97    3405    1184   .113   11.0     385   133.8   100    3.0
8 16 MG       65   1.750   13.05    495   14.870   10933      49    2480     115   .077    3.8     191     8.9    24   16.0
9 C.T.      1739   1.460    9.91     82   13.893    3311     468     737       7   .143   67.0     105     1.0     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.1      62     9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     4.0      62     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     4.1      63     9.2
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(     4.0) + 0.65(     4.1) =     4.081   GM/BHP HR
                                          CO- NDIR 0.35(    62.5) + 0.65(    63.0) =    62.839   GM/BHP HR
                                          NO2-NDIR 0.35(     9.0) + 0.65(     9.2) =     9.092   GM/BHP HR
                                                              CORRECTED NO2 =    10.053   GM/BHP HR
                                                                       BSFC =      .771   LB/BHP HR


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             CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR             MAN.
MODE       HC-FID     CO     CO2  NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID    CO   NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE       857    .950   12.92     75   13.956    3221      21     218       6   .232    4.8      50     1.4     0   16.0
2 16 MG     1618   1.550   13.08    400   14.792   10933     114    2208      94   .077    8.8     170     7.2    24   16.0
3 10 MG     1698   1.000   13.29   1475   14.410   15695     185    2200     533   .147   27.2     323    78.4    60   10.0
4 16 MG     1576   1.500   13.12    425   14.778   10933     111    2139     100   .077    8.6     165     7.7    24   16.0
5 19 MG     1223   1.850   13.05    150   15.022    7348      60    1828      24   .057    3.4     104     1.4     5   19.0
6 16 MG     1676   1.710   13.03    425   14.908   10933     117    2417      99   .077    9.0     186     7.6    24   16.0
7  3 MG     1016   1.070   12.85   2075   14.022   22635     164    3484    1112   .113   18.5     394   125.7   100    3.0
8 16 MG     1705   1.830   12.96    425   14.961   10933     119    2578      98   .077    9.2     198     7.6    24   16.0
9 C.T.     23422   1.570    9.76     38   13.672    3311     567     768       3   .143   81.1     110      .4     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.1      61     8.5
1 IDLE       857    .950   12.92     75   13.956    3221      21     218       6   .232    4.8      50     1.4     0   16.0
2 16 MG     1918   1.670   13.04    400   14.902   10933     134    2362      93   .077   10.3     182     7.2    24   16.0
3 10 MG     1783   1.040   13.22   1513   14.438   15695     194    2284     546   .147   28.5     336    80.3    60   10.0
4 16 MG     1734   1.810   13.03    400   15.013   10933     121    2541      92   .077    9.3     196     7.1    24   16.0
5 19 MG     1450   1.940   12.88    150   14.965    7348      71    1924      24   .057    4.1     110     1.4     5   19.0
6 16 MG     1719   1.720   13.01    425   14.902   10933     120    2432      99   .077    9.3     187     7.6    24   16.0
7  3 MG      960   1.030   12.96   2138   14.086   22635     154    3343    1141   .113   17.4     378   128.9   100    3.0
8 16 MG     1790   1.850   12.92    425   14.949   10933     125    2608      98   .077    9.6     201     7.6    24   16.0
9 C.T.     24322   1.540    9.87     38   13.842    3311     582     744       3   .143   83.2     106      .4     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.3      63     8.7
1 IDLE      1154    .600   13.02     75   13.735    3221      27     284       6   .232    6.3      66     1.4     0   16.0
2 16 MG     1903   1.690   13.08    388   14.900   10933     133    2390      90   .077   10.3     184     6.9    24   16.0
3 10 MG     1826   1.080   13.20   1475   14.963   15695     198    2367     531   .147   29.1     348    78.1    60   10.0
4 16 MG     1763   1.780   13.09    387   15.096   10933     122    2493      89   .077    9.4     192     6.9    24   16.0
5 19 MG     1388   1.870   12.99    150   14.999    7348      68    1851      24   .057    3.9     105     1.4     5   19.0
6 16 MG     1790   1.750   13.04    420   14.969   10933     125    2464      97   .077    9.6     190     7.5    24   16.0
7  3 MG      988   1.020   12.99   2175   14.109   22635     159    3306    1158   .113   17.9     374   130.9   100    3.0
8 16 MG     1749   1.860   12.98    400   15.015   10933     122    2611      92   .077    9.4     201     7.1    24   16.0
9 C.T.     24758   1.560    9.82     38   13.856    3311     592     753       3   .143   84.6     108      .4     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.5      64     8.7
1 IDLE      1154    .600   13.08     75   13.735    3221      27     284       6   .232    6.3      66     1.4     0   16.0
2 16 MG     1931   1.720   12.97    425   14.883   10933     135    2436      99   .077   10.4     188     7.6    24   16.0
3 10 MG     1826   1.000   13.26   1525   14.443   15695     198    2195     550   .147   29.2     323    80.9    60   10.0
4 16 MG     1875   1.750   13.00    425   14.938   10933     131    2469      99   .077   10.1     190     7.6    24   16.0
5 19 MG     1392   1.630   13.11    156   14.879    7348      69    1626      26   .057    3.9      93     1.5     5   19.0
6 16 MG     1761   1.620   13.10    450   14.896   10933     123    2292     105   .077    9.5     176     8.1    24   16.0
7  3 MG     1130   1.050   12.99   2212   14.183   22635     181    3392    1175   .113   20.4     383   132.7   100    3.0
8 16 MG     1904   1.750   13.05    450   14.990   10933     133    2460     104   .077   10.2     189     8.0    24   16.0
9 C.T.     24256   1.460    9.91     45   13.896    3311     592     705       4   .143   84.7     101      .5     0   22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.6      61     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     6.2      62     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     6.6      63     8.8
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(     6.2) + 0.65(     6.6) =     6.453   GM/BHP HR
                                          CO- NDIR 0.35(    62.0) + 0.65(    62.5) =    62.349   GM/BHP HR
                                          NO2-CL   0.35(     8.6) + 0.65(     8.8) =     8.732   GM/BHP HR
                                                              CORRECTED NO2 =     9.654   GM/BHP HR
                                                                       BSFC =      .771   LB/BHP HR
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                       TABLE F-6  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-55  RUN-1   PARAMETRIC BASELINE   07-25-73       K =1.015      HUM = 79.9  GR/LB
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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
              HC      CO     CO2      NO    CARBON    CONS.     HC      CO     NO2    FACT.    HC      CO    NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE        109   1.500   12.63      98   14.292    3583      28     762      8    .232     6.6    177    1.9     0   19.5
2 16 HG        38    .300   13.98     297   14.321    9117      26     386     63    .077     2.0     30    4.8    13   16.0
3 10 HG        35    .250   13.43    1099   13.718   14288      39     526    363    .147     5.8     77   53.3    48   10.0
4 16 HG        34    .270   14.02     252   14.327    9117      23     347     53    .077     1.8     27    4.1    13   16.0
5 19 HG        33    .240   13.99     127   14.266    7258      18     247     21    .057     1.0     14    1.2     0   19.0
6 16 HG        33    .240   14.06     273   14.336    9117      23     308     58    .077     1.7     24    4.4    13   16.0
7  3 HG        50    .980   13.49    2103   14.524   21682      81    2955   1042    .113     9.1    334  117.8    93    3.0
8 16 HG        37    .230   13.94     286   14.210    9117      26     298     61    .077     2.0     23    4.7    13   16.0
9 C.T.       2278   2.690    9.16      86   14.310    3674     632    1395      7    .143    90.3    199    1.0     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     5.6     42    9.0
1 IDLE        109   1.500   12.63      98   14.292    3583      28     762      8    .232     6.6    177    1.9     0   19.5
2 16 HG        43    .320   14.09     246   14.456    9117      29     408     52    .077     2.3     31    4.0    13   16.0
3 10 HG        38    .260   13.69    1183   13.991   14288      42     536    401    .147     6.2     79   59.0    48   10.0
4 16 HG        38    .380   14.09     261   14.511    9117      26     482     54    .077     2.0     37    4.2    13   16.0
5 19 HG        37    .270   14.11     122   14.420    7258      20     275     20    .057     1.1     16    1.2     0   19.0
6 16 HG        34    .290   14.23     325   14.557    9117      23     367     68    .077     1.8     28    5.2    13   16.0
7  3 HG        48    .890   13.61    2052   14.552   21682      77    2679   1015    .113     8.7    303  114.7    93    3.0
8 16 HG        41    .330   14.24     276   14.614    9117      28     416     57    .077     2.1     32    4.4    13   16.0
9 C.T.       2215   2.840    9.23     108   14.462    3674     608    1457      9    .143    86.9    208    1.3     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     5.4     42    9.1
1 IDLE        127   2.210   12.87     110   15.217    3583      32    1051      9    .232     7.5    244    2.0     0   19.5
2 16 HG        39    .390   14.20     310   14.632    9117      26     491     64    .077     2.0     38    4.9    13   16.0
3 10 HG        34    .210   13.85    1169   14.097   14288      37     431    395    .147     5.5     63   58.0    48   10.0
4 16 HG        33    .280   14.27     291   14.586    9117      22     354     60    .077     1.7     27    4.6    13   16.0
5 19 HG        33    .260   14.36     135   14.646    7258      18     260     22    .057     1.0     15    1.3     0   19.0
6 16 HG        34    .400   14.24     201   14.677    9117      23     502     41    .077     1.8     39    3.2    13   16.0
7  3 HG        49    .770   13.81    2068   14.633   21682      78    2305   1017    .113     8.8    260  115.0    93    3.0
8 16 HG        41    .430   14.28     264   14.754    9117      27     537     54    .077     2.1     41    4.2    13   16.0
9 C.T.       2348   2.710    9.17      89   14.416    3674     646    1398      8    .143    92.4    200    1.1     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     5.7     43    9.0
1 IDLE        127   2.210   12.87     110   15.217    3583      32    1051      9    .232     7.5    244    2.0     0   19.5
2 16 HG        42    .400   14.27     243   14.715    9117      28     501     50    .077     2.2     39    3.8    13   16.0
3 10 HG        36    .240   13.86    1039   14.139   14288      39     490    349    .147     5.8     72   51.2    48   10.0
4 16 HG        39    .570   14.27     262   14.882    9117      26     705     53    .077     2.0     54    4.1    13   16.0
5 19 HG        37    .410   14.47     107   14.920    7258      19     403     17    .057     1.1     23    1.0     0   19.0
6 16 HG        35    .390   14.34     252   14.768    9117      23     486     52    .077     1.8     37    4.0    13   16.0
7  3 HG        46    .710   13.92    2125   14.680   21682      73    2118   1042    .113     8.3    239  117.7    93    3.0
8 16 HG        39    .290   14.46     271   14.787    9117      23     361     55    .077     1.7     28    4.3    13   16.0
9 C.T.       2297   2.740    9.26      95   14.481    3674     629    1404      8    .143    90.0    201    1.1     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     5.6     43    8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     5.5     42    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     5.6     43    8.9
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(      5.5) + 0.65(      5.6) =     5.590   GM/BHP HR
                                  CO- NDIR 0.35(     42.1) + 0.65(     43.2) =    42.776   GM/BHP HR
                                  NO2-NDIR 0.35(      9.0) + 0.65(      8.9) =     8.927   GM/BHP HR
                                                        CORRECTED NO2 =     9.060   GM/BHP HR
                                                                 BSFC =      .932   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
            HC-FID     CO     CO2   NO-CL   CARBON    CONS.     HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE       3053   1.500   12.63      50   14.435    3583      76     752      4    .232    17.6    174    1.0     0   19.5
2 16 HG       340    .300   13.98     270   14.314    9117      22     386     57    .077     1.7     30    4.4    13   16.0
3 10 HG       282    .250   13.43    1040   13.708   14288      29     526    360    .147     4.3     77   52.9    48   10.0
4 16 HG       198    .270   14.02     250   14.310    9117      13     347     53    .077     1.0     27    4.1    13   16.0
5 19 HG       165    .240   13.99     100   14.246    7258       8     247     17    .057      .5     14    1.0     0   19.0
6 16 HG       191    .240   14.06     250   14.319    9117      12     309     53    .077      .9     24    4.1    13   16.0
7  3 HG       822    .980   13.49    2100   14.552   21682     122    2949   1039    .113    13.8    333  117.4    93    3.0
8 16 HG       233    .230   13.94     275   14.193    9117      15     298     59    .077     1.2     23    4.5    13   16.0
9 C.T.      30625   2.690    9.16      20   14.913    3674     755    1339      2    .143   107.9    191     .2     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     6.9     41    8.8
1 IDLE       3053   1.500   12.63      50   14.435    3583      76     752      4    .232    17.6    174    1.0     0   19.5
2 16 HG       453    .320   14.09     220   14.455    9117      29     408     46    .077     2.2     31    3.5    13   16.0
3 10 HG       339    .260   13.69    1175   13.984   14288      35     537    399    .147     5.1     79   58.6    48   10.0
4 16 HG       312    .380   14.09     225   14.501    9117      20     483     47    .077     1.5     37    3.6    13   16.0
5 19 HG       227    .270   14.11      90   14.403    7258      11     275     15    .057      .7     16     .9     0   19.0
6 16 HG       284    .290   14.23     290   14.548    9117      18     367     60    .077     1.4     28    4.6    13   16.0
7  3 HG       744    .890   13.61    2025   14.574   21682     118    2674   1000    .113    13.3    302  113.0    93    3.0
8 16 HG       297    .330   14.24     240   14.600    9117      19     416     50    .077     1.4     32    3.8    13   16.0
9 C.T.      30237   2.840    9.23      28   15.094    3674     736    1396      2    .143   105.2    200     .3     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     6.9     42    8.6
1 IDLE       3703   2.210   12.87      55   15.450    3583      86    1035      4    .232    19.9    240    1.0     0   19.5
2 16 HG       482    .390   14.20     240   14.638    9117      30     491     50    .077     2.3     38    3.8    13   16.0
3 10 HG       325    .210   13.85    1100   14.093   14288      33     432    372    .147     4.9     63   54.6    48   10.0
4 16 HG       298    .280   14.27     225   14.580    9117      19     354     47    .077     1.4     27    3.6    13   16.0
5 19 HG       227    .260   14.36      85   14.643    7258      11     261     14    .057      .6     15     .8     0   19.0
6 16 HG       255    .400   14.24     250   14.666    9117      16     502     52    .077     1.2     39    4.0    13   16.0
7  3 HG       823    .770   13.81    2063   14.662   21682     122    2300   1013    .113    13.7    260  114.4    93    3.0
8 16 HG       312    .430   14.28     250   14.741    9117      19     537     51    .077     1.5     41    4.0    13   16.0
9 C.T.      30189   2.710    9.17      29   14.899    3674     744    1350      2    .143   106.5    193     .3     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     7.0     42    8.6
1 IDLE       3703   2.210   12.87      55   15.450    3583      86    1036      4    .232    19.9    240    1.0     0   19.5
2 16 HG       511    .400   14.27     215   14.721    9117      32     500     44    .077     2.4     39    3.4    13   16.0
3 10 HG       311    .240   13.86    1000   14.131   14288      31     490    336    .147     4.6     72   49.3    48   10.0
4 16 HG       383    .570   14.27     235   14.878    9117      23     706     48    .077     1.8     54    3.7    13   16.0
5 19 HG       328    .410   14.47      85   14.913    7258      16     403     14    .057      .9     23     .8     0   19.0
6 16 HG       319    .390   14.34     220   14.762    9117      20     487     45    .077     1.5     37    3.5    13   16.0
7  3 HG       795    .710   13.92    2050   14.709   21682     117    2114   1008    .113    13.2    239  113.9    93    3.0
8 16 HG       270    .290   14.46     235   14.777    9117      17     361     48    .077     1.3     28    3.7    13   16.0
9 C.T.      31552   2.740    9.26      26   15.155    3674     765    1392      2    .143   109.4    199     .3     0   22.0
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------     7.2     43    8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     6.9     42    8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     7.1     43    8.5
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(      6.9) + 0.65(      7.1) =     7.033   GM/BHP HR
                                  CO- NDIR 0.35(     41.5) + 0.65(     42.6) =    42.239   GM/BHP HR
                                  NO2-CL   0.35(      8.8) + 0.65(      8.5) =     8.573   GM/BHP HR
                                                        CORRECTED NO2 =     8.700   GM/BHP HR
                                                                 BSFC =      .932   LB/BHP HR
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                  TABLE F-7  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-55  RUN-2   PARAMETRIC BASELINE   07-25-73      K =1.079      HUM =106.8  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR               MAN.
MODE            HC       CO     CO2     NO    CARBON   CONS.       HC      CO      NO2    FACT.    HC        CO      NO2     HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE         133   1.660   12.60      86   14.404    3583       36     839        7    .232     8.3      194      1.6     0     19.5
2 16 MG         39    .300   13.87     261   14.212    9117       27     389       56    .077     2.1       30      4.3    13     16.0
3 10 MG         25    .670   13.38     947   14.077   14288       27    1374      319    .147     4.0      202     46.9    48     10.0
4 16 MG         28    .280   14.03     260   14.340    9117       19     360       55    .077     1.5       28      4.2    13     16.0
5 19 MG         27    .310   13.97     108   14.309    7258       15     318       18    .057      .8       18      1.0     0     19.0
6 16 MG         25    .340   14.06     264   14.427    9117       17     434       55    .077     1.3       33      4.3    13     16.0
7  3 MG         51    .910   13.40    2012   14.365   21682       83    2774     1008    .113     9.4      314    113.9    93      3.0
8 16 MG         26    .440   14.02     251   14.488    9117       18     559       52    .077     1.4       43      4.0    13     16.0
9 C.T.        2200   2.360    9.15      83   13.886    3674      629    1261        7    .143    89.9      180      1.0     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     5.5       48      8.4
1 IDLE         133   1.660   12.60      86   14.404    3583       36     839        7    .232     8.3      194      1.6     0     19.5
2 16 MG         38    .250   14.00     253   14.291    9117       26     322       54    .077     2.0       25      4.1    13     16.0
3 10 MG         33    .410   14.64     986   15.086   14288       34     784      310    .147     5.0      115     45.6    48     10.0
4 16 MG         31    .320   14.06     255   14.413    9117       21     409       54    .077     1.6       31      4.1    13     16.0
5 19 MG         29    .230   14.08     127   14.341    7258       16     235       21    .057      .9       13      1.2     0     19.0
6 16 MG         29    .310   14.14     267   14.481    9117       20     394       56    .077     1.5       30      4.3    13     16.0
7  3 MG         43    .620   13.53    2150   14.196   21682       71    1913     1090    .113     8.0      216    123.2    93      3.0
8 16 MG         38    .390   14.20     284   14.631    9117       26     491       59    .077     2.0       38      4.5    13     16.0
9 C.T.        2209   2.440    9.28     116   14.106    3674      621    1284       10    .143    88.9      184      1.4     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     5.5       39      8.8
1 IDLE         115   1.920   12.98     103   15.024    3583       30     925        8    .232     6.9      215      1.9     0     19.5
2 16 MG         36    .300   14.48     287   14.819    9117       24     373       59    .077     1.8       29      4.5    13     16.0
3 10 MG         30    .220   13.85    1061   14.102   14288       33     450      357    .147     4.8       66     52.5    48     10.0
4 16 MG         31    .320   14.23     252   14.583    9117       21     404       52    .077     1.6       31      4.0    13     16.0
5 19 MG         34    .310   14.28     102   14.627    7258       18     311       17    .057     1.0       18      1.0     0     19.0
6 16 MG         30    .350   14.22     265   14.602    9117       20     441       55    .077     1.6       34      4.2    13     16.0
7  3 MG         45    .720   13.81    2071   14.579   21682       72    2163     1023    .113     8.2      244    115.6    93      3.0
8 16 MG         31    .380   14.31     281   14.723    9117       21     475       58    .077     1.6       37      4.4    13     16.0
9 C.T.        2176   2.470    9.21      84   14.030    3674      615    1307        7    .143    88.0      187      1.0     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     5.3       40      8.8
1 IDLE         115   1.920   12.98     103   15.024    3583       30     925        8    .232     6.9      215      1.9     0     19.5
2 16 MG         34    .250   14.42     269   14.707    9117       23     313       55    .077     1.8       24      4.3    13     16.0
3 10 MG         31    .200   13.92    1062   14.153   14288       34     408      356    .147     5.0       60     52.3    48     10.0
4 16 MG         32    .380   14.45     325   14.865    9117       21     471       66    .077     1.6       36      5.1    13     16.0
5 19 MG         29    .250   14.52     156   14.801    7258       15     248       25    .057      .9       14      1.4     0     19.0
6 16 MG         28    .260   14.49     300   14.780    9117       19     324       61    .077     1.4       25      4.7    13     16.0
7  3 MG         42    .640   14.04    2239   14.725   21682       67    1904     1095    .113     7.6      215    123.7    93      3.0
8 16 MG         43    .400   14.64     320   15.086    9117       28     488       64    .077     2.2       38      4.9    13     16.0
9 C.T.        2245   2.350    9.53     149   14.305    3674      623    1219       13    .143    89.1      174      1.8     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     5.4       37      9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     5.5       44      8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     5.4       38      9.0
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(      5.5) + 0.65(      5.4) =     5.409   GM/BHP HR
                                        CO- NDIR 0.35(     43.7) + 0.65(     38.5) =    40.303   GM/BHP HR
                                        NO2-NDIR 0.35(      8.6) + 0.65(      9.0) =     8.871   GM/BHP HR
                                                              CORRECTED NO2 =     9.573   GM/BHP HR
                                                                       BSFC =      .932   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR               MAN.
MODE          HC-FID     CO     CO2   NO-CL   CARBON   CONS.       HC      CO      NO2    FACT.  HC-FID      CO   NO2-CL    HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE        3622   1.660   12.60      45   14.622    3583       89     822        4    .232    20.6      191       .8     0     19.5
2 16 MG        396    .300   13.87     220   14.210    9117       25     389       47    .077     2.0       30      3.6    13     16.0
3 10 MG        226    .670   13.38     910   14.073   14288       23    1374      307    .147     3.4      202     45.1    48     10.0
4 16 MG        286    .280   14.03     190   14.339    9117       18     360       40    .077     1.4       28      3.1    13     16.0
5 19 MG        181    .310   13.97      90   14.298    7258        9     318       15    .057      .5       18       .9     0     19.0
6 16 MG        252    .340   14.06     230   14.425    9117       16     434       48    .077     1.2       33      3.7    13     16.0
7  3 MG        878    .910   13.40    1988   14.398   21682      132    2768      994    .113    14.9      313    112.3    93      3.0
8 16 MG        262    .440   14.02     238   14.486    9117       16     559       50    .077     1.3       43      3.8    13     16.0
9 C.T.       29211   2.360    9.15      50   14.431    3674      744    1219        4    .143   106.3      174       .6     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     7.0       48      8.1
1 IDLE        3622   1.660   12.60      45   14.622    3583       89     822        4    .232    20.6      191       .8     0     19.5
2 16 MG        402    .250   14.00     215   14.290    9117       26     322       46    .077     2.0       25      3.5    13     16.0
3 10 MG        285    .410   14.64     950   15.078   14288       27     785      299    .147     4.0      115     43.9    48     10.0
4 16 MG        270    .320   14.06     225   14.407    9117       17     409       47    .077     1.3       31      3.6    13     16.0
5 19 MG        170    .230   14.08     100   14.327    7258        9     235       17    .057      .5       13      1.0     0     19.0
6 16 MG        209    .310   14.14     235   14.471    9117       13     395       49    .077     1.0       30      3.8    13     16.0
7  3 MG        798    .620   13.53    2087   14.230   21682      122    1908     1056    .113    13.7      216    119.3    93      3.0
8 16 MG        270    .390   14.20     235   14.617    9117       17     491       49    .077     1.3       38      3.7    13     16.0
9 C.T.       28375   2.440    9.28      35   14.558    3674      716    1244        3    .143   102.4      178       .4     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     6.8       39      8.3
1 IDLE        3157   1.920   12.98      50   15.216    3583       74     913        4    .232    17.2      212       .9     0     19.5
2 16 MG        413    .300   14.48     220   14.821    9117       25     373       45    .077     2.0       29      3.5    13     16.0
3 10 MG        276    .220   13.85     943   14.098   14288       28     450      317    .147     4.1       66     46.6    48     10.0
4 16 MG        327    .320   14.23     225   14.583    9117       20     404       47    .077     1.6       31      3.6    13     16.0
5 19 MG        227    .310   14.28      85   14.613    7258       11     311       14    .057      .6       18       .8     0     19.0
6 16 MG        262    .350   14.22     240   14.596    9117       16     442       50    .077     1.3       34      3.8    13     16.0
7  3 MG        787    .720   13.81    2038   14.609   21682      117    2159     1004    .113    13.2      244    113.5    93      3.0
8 16 MG        299    .380   14.31     245   14.720    9117       19     475       50    .077     1.4       37      3.9    13     16.0
9 C.T.       27423   2.470    9.21      35   14.422    3674      709    1267        3    .143   101.4      181       .4     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     6.6       39      8.2
1 IDLE        3157   1.920   12.98      50   15.216    3583       74     913        4    .232    17.2      212       .9     0     19.5
2 16 MG        412    .250   14.42     230   14.711    9117       26     313       47    .077     2.0       24      3.6    13     16.0
3 10 MG        349    .200   13.92     970   14.155   14288       35     408      325    .147     5.2       60     47.8    48     10.0
4 16 MG        328    .380   14.45     245   14.863    9117       20     471       50    .077     1.5       36      3.8    13     16.0
5 19 MG        316    .250   14.52      85   14.802    7258       15     248       14    .057      .9       14       .8     0     19.0
6 16 MG        284    .260   14.49     230   14.778    9117       18     324       47    .077     1.3       25      3.6    13     16.0
7  3 MG        867    .640   14.04    2175   14.767   21682      127    1898     1060    .113    14.4      214    119.8    93      3.0
8 16 MG        313    .400   14.64     260   15.071    9117       19     489       50    .077     1.5       38      3.9    13     16.0
9 C.T.       28413   2.350    9.53      40   14.721    3674      709    1185        3    .143   101.4      169       .5     0     22.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     6.7       37      8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     6.9       43      8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     6.7       38      8.4
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      6.9) + 0.65(      6.7) =     6.756   GM/BHP HR
                                        CO- NDIR 0.35(     43.3) + 0.65(     38.1) =    39.890   GM/BHP HR
                                        NO2-CL   0.35(      8.2) + 0.65(      8.4) =     8.315   GM/BHP HR
                                                              CORRECTED NO2 =     8.973   GM/BHP HR
                                                                       BSFC =      .932   LB/BHP HR
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                        TABLE F-8  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-55  RUN-3   PARAMETRIC BASELINE   07-25-73      K =1.079      HUM =106.8  GR/LB
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             CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2     NO    CARBON    CONS.      HC      CO      NO2     FACT.     HC       CO      NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        118   1.620  12.67    117    14.917    3583       32     813      10     .232      7.3     189      2.2     0    14.5
2 16 MG        31    .340  13.72    281    14.093    9117       22     444      60     .077      1.7      34      4.6    13    16.0
3 10 MG        26    .290  13.36   1126    13.628   14288       29     508     392     .147      4.3      75     57.6    48    10.0
4 16 MG        26    .330  13.90    288    14.258    9117       18     426      61     .077      1.4      33      4.7    13    16.0
5 19 MG        27    .290  13.88    156    14.199    7258       15     299      26     .057       .8      17      1.5     0    19.0
6 16 MG        26    .280  13.93    300    14.238    9117       18     362      64     .077      1.4      28      4.9    13    16.0
7  3 MG        40    .680  13.52   2245    14.243   21682       66    2091    1135     .113      7.4     236    128.2    93     3.0
8 16 MG        38    .380  14.01    309    14.431    9117       26     485      65     .077      2.0      37      5.0    13    16.0
9 C.T.       2165   2.360   9.16    117    13.858    3674      620    1264      10     .143     88.6     181      1.5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.3      38      9.7
1 IDLE        118   1.620  12.67    117    14.917    3583       32     813      10     .232      7.3     189      2.2     0    14.5
2 16 MG        36    .330  14.07    287    14.439    9117       25     421      60     .077      1.9      32      4.6    13    16.0
3 10 MG        32    .190  13.73   1187    13.955   14288       35     393     404     .147      5.2      58     59.3    48    10.0
4 16 MG        32    .340  14.12    296    14.495    9117       22     432      62     .077      1.7      33      4.8    13    16.0
5 19 MG        34    .350  14.12    170    14.507    7258       18     354      28     .057      1.0      20      1.6     0    19.0
6 16 MG        31    .280  14.19    313    14.503    9117       21     356      65     .077      1.6      27      5.0    13    16.0
7  3 MG        44    .780  13.56   2279    14.398   21682       72    2374    1138     .113      8.1     268    128.6    93     3.0
8 16 MG        38    .280  14.37    294    14.641    9117       25     351      61     .077      2.0      27      4.7    13    16.0
9 C.T.       2083   2.440   9.16    127    13.850    3674      597    1308      11     .143     85.3     187      1.6     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.3      39      9.8
1 IDLE        105   2.050  12.94    150    15.103    3583       27     982      12     .232      6.2     228      2.7     0    14.5
2 16 MG        37    .380  14.15    312    14.570    9117       25     480      65     .077      1.9      37      5.0    13    16.0
3 10 MG        31    .270  13.83   1190    14.133   14288       34     551     399     .147      5.0      81     58.7    48    10.0
4 16 MG        33    .340  14.36    298    14.736    9117       22     425      61     .077      1.7      33      4.7    13    16.0
5 19 MG        33    .370  14.37    162    14.776    7258       18     367      26     .057      1.0      21      1.5     0    19.0
6 16 MG        32    .330  14.37    360    14.735    9117       21     412      74     .077      1.6      32      5.7    13    16.0
7  3 MG        44    .610  13.80   2239    14.458   21682       71    1848    1115     .113      8.1     209    126.0    93     3.0
8 16 MG        35    .340  14.27    320    14.648    9117       24     427      66     .077      1.8      33      5.1    13    16.0
9 C.T.       2114   2.390   9.11    137    13.783    3674      609    1287      12     .143     87.0     184      1.7     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.3      40      9.8
1 IDLE        105   2.050  12.94    150    15.103    3583       27     982      12     .232      6.2     228      2.7     0    14.5
2 16 MG        38    .370  14.16    383    14.571    9117       26     468      80     .077      2.0      36      6.1    13    16.0
3 10 MG        30    .270  13.84   1196    14.192   14288       33     551     401     .147      4.8      81     59.0    48    10.0
4 16 MG        33    .270  14.32    287    14.626    9117       22     340      59     .077      1.7      26      4.6    13    16.0
5 19 MG        38    .330  14.43    168    14.801    7258       20     327      27     .057      1.1      19      1.6     0    19.0
6 16 MG        30    .260  14.29    315    14.582    9117       20     328      65     .077      1.6      25      5.0    13    16.0
7  3 MG        44    .630  13.81   2295    14.488   21682       71    1905    1140     .113      8.0     215    128.9    93     3.0
8 16 MG        33    .460  14.23    332    14.726    9117       22     575      68     .077      1.7      44      5.3    13    16.0
9 C.T.       2178   2.400   9.51    143    14.262    3674      606    1249      12     .143     86.7     179      1.7     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     5.3      40     10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     5.3      39      9.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     5.3      40      9.9
FOUR CYCLE COMPOSITE -
                                HC- NDIR 0.35(     5.3) + 0.65(     5.3) =    5.292   GM/BHP HR
                                CO- NDIR 0.35(    38.7) + 0.65(    39.6) =   39.289   GM/BHP HR
                                NO2-NDIR 0.35(     9.8) + 0.65(     9.9) =    9.838   GM/BHP HR
                                                     CORRECTED NO2 =   10.617   GM/BHP HR
                                                              BSFC =     .932   LB/BHP HR


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             CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR              MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO      NO2     FACT.   HC-FID     CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       3793   1.620  12.67     60    14.669    3583       93     799       5     .232     21.5     185      1.1     0    14.5
2 16 MG       396    .340  13.72    240    14.100    9117       26     444      52     .077      2.0      34      4.0    13    16.0
3 10 MG       296    .290  13.36   1100    13.630   14288       31     508     383     .147      4.6      75     56.3    48    10.0
4 16 MG       269    .330  13.90    238    14.257    9117       17     426      51     .077      1.3      33      3.9    13    16.0
5 19 MG       261    .290  13.88    100    14.196    7258       13     299      17     .057       .8      17      1.0     0    19.0
6 16 MG       304    .280  13.93    260    14.240    9117       19     362      55     .077      1.5      28      4.3    13    16.0
7  3 MG       415    .680  13.52   2238    14.292   21682      139    2089    1127     .113     15.7     235    127.4    93     3.0
8 16 MG       255    .380  14.01    260    14.415    9117       16     485      55     .077      1.2      37      4.2    13    16.0
9 C.T.      28771   2.360   9.16     40    14.397    3674      734    1217       3     .143    105.0     174       .5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     7.1      38      9.4
1 IDLE       3793   1.620  12.67     60    14.669    3583       93     799       5     .232     21.5     185      1.1     0    14.5
2 16 MG       403    .330  14.07    220    14.440    9117       25     421      46     .077      2.0      32      3.6    13    16.0
3 10 MG       282    .190  13.73   1125    13.948   14288       29     393     383     .147      4.2      58     56.2    48    10.0
4 16 MG       283    .340  14.12    250    14.488    9117       16     432      52     .077      1.4      33      4.0    13    16.0
5 19 MG       305    .350  14.12    100    14.501    7258       15     354      17     .057       .9      20       .9     0    19.0
6 16 MG       292    .280  14.19    263    14.494    9117       15     356      55     .077      1.2      27      4.2    13    16.0
7  3 MG       821    .780  13.56   2225    14.482   21682      123    2369    1111     .113     14.0     268    125.5    93     3.0
8 16 MG       266    .280  14.37    250    14.677    9117       17     351      52     .077      1.3      27      4.0    13    16.0
9 C.T.      26575   2.440   9.16     38    14.258    3674      685    1270       3     .143     97.9     182       .5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     6.7      39      9.3
1 IDLE       3359   2.050  12.94     55    15.326    3583       79     968       4     .232     18.2     225      1.0     0    14.5
2 16 MG       510    .380  14.16    240    14.581    9117       32     480      50     .077      2.5      37      3.8    13    16.0
3 10 MG       297    .270  13.83   1125    14.130   14288       30     552     378     .147      4.4      81     55.5    48    10.0
4 16 MG       306    .340  14.36    235    14.731    9117       19     425      48     .077      1.5      33      3.7    13    16.0
5 19 MG       327    .370  14.37     85    14.773    7258       16     367      14     .057       .9      21       .8     0    19.0
6 16 MG       299    .330  14.37    300    14.730    9117       18     413      62     .077      1.4      32      4.7    13    16.0
7  3 MG       793    .610  13.80   2200    14.489   21682      119    1844    1093     .113     13.4     208    123.5    93     3.0
8 16 MG       334    .340  14.27    240    14.643    9117       21     428      50     .077      1.6      33      3.8    13    16.0
9 C.T.      27881   2.390   9.11     35    14.288    3674      717    1241       3     .143    102.5     178       .4     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     6.8      39      9.1
1 IDLE       3359   2.050  12.94     55    15.326    3583       79     968       4     .232     18.2     225      1.0     0    14.5
2 16 MG       475    .370  14.16    300    14.578    9117       30     467      62     .077      2.3      36      4.8    13    16.0
3 10 MG       304    .270  13.84   1163    14.190   14288       31     551     390     .147      4.5      81     57.4    48    10.0
4 16 MG       298    .270  14.32    240    14.620    9117       19     340      50     .077      1.4      26      3.8    13    16.0
5 19 MG       388    .330  14.43     90    14.799    7258       19     327      15     .057      1.1      19       .8     0    19.0
6 16 MG       255    .260  14.29    240    14.576    9117       16     329      50     .077      1.2      25      3.8    13    16.0
7  3 MG       824    .630  13.81   2263    14.522   21682      123    1900    1122     .113     13.9     215    126.8    93     3.0
8 16 MG       306    .460  14.23    265    14.721    9117       19     575      54     .077      1.5      44      4.2    13    16.0
9 C.T.      28198   2.400   9.51     45    14.730    3674      703    1209       4     .143    100.6     173       .5     0    22.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     6.7      39      9.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     6.9      38      9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     6.7      39      9.3
FOUR CYCLE COMPOSITE -
                                HC- FID  0.35(     6.9) + 0.65(     6.7) =    6.795   GM/BHP HR
                                CO- NDIR 0.35(    38.2) + 0.65(    39.1) =   38.831   GM/BHP HR
                                NO2-CL   0.35(     9.3) + 0.65(     9.3) =    9.290   GM/BHP HR
                                                     CORRECTED NO2 =   10.026   GM/BHP HR
                                                              BSFC =     .932   LB/BHP HR
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                                   TABLE F-9  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-58   RUN-3  PARAMETRIC BASELINE   07-30-73      K =1.034      HUM = 86.6  GR/LB
-----------------------------------------------------------------------------------------------------------------------
             CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR      MAN.
MODE          HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2   FACT.    HC     CO    NO2   HP   VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        69   2.030   10.79    127   12.889    3538      19    1126      12   .232
2 16 HG       25    .440   13.55    397   14.017    9253      18     587      87   .077    4.4    261    2.7    0  15.1
3 10 HG       21    .200   13.32   1443   13.543   13971      23     417     494   .147    1.4     45    6.7   14  16.0
4 16 HG       21    .340   13.67    437   14.033    9253      15     453      96   .077    3.4     61   72.7   48  10.0
5 19 HG       21    .330   13.59    163   13.943    7122      12     341      28   .057    1.2     35    7.4   14  16.0
6 16 HG       20    .320   13.71    393   14.052    9253      14     426      86   .077     .7     19    1.6    0  19.0
7  3 HG       37    .880   13.26   2319   14.180   21637      61    2712    1175   .113    1.1     33    6.6   14  16.0
8 16 HG       22    .290   13.78    367   14.094    9253      16     385      80   .077    6.9    307  132.8   92   3.0
9 C.T.      2034   2.810    8.21    109   13.217    3674     611    1578      10   .143    1.2     30    6.2   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------   87.3    226    1.4    0  22.2
1 IDLE        69   2.030   10.79    127   12.889    3538      19    1126      12   .232    4.9     46   10.8
2 16 HG       28    .370   13.67    391   14.070    9253      20     492      85   .077    4.4    261    2.7    0  15.1
3 10 HG       22    .180   13.32   1403   13.524   13971      25     376     481   .147    1.5     38    6.6   14  16.0
4 16 HG       21    .270   13.74    362   14.033    9253      15     360      79   .077    3.6     55   70.7   48  10.0
5 19 HG       20    .320   13.64    130   13.982    7122      11     329      22   .057    1.2     28    6.1   14  16.0
6 16 HG       24    .390   13.68    405   14.096    9253      17     517      88   .077     .6     19    1.3    0  19.0
7  3 HG       38    .780   13.29   2387   14.111   21637      63    2416    1215   .113    1.3     40    6.8   14  16.0
8 16 HG       24    .260   13.78    376   14.066    9253      17     345      82   .077    7.1    273  137.3   92   3.0
9 C.T.      2019   2.790    8.29    109   13.261    3674     604    1561      10   .143    1.3     27    6.3   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------   86.4    223    1.4    0  22.2
1 IDLE        88   2.390   11.22    123   13.705    3538      25    1246      11   .232    4.9     44   10.8
2 16 HG       28    .320   13.74    317   14.090    9253      20     424      69   .077    5.7    289    2.4    0  15.1
3 10 HG       25    .160   13.38   1425   13.567   13971      28     333     487   .147    1.5     33    5.3   14  16.0
4 16 HG       21    .280   13.79    378   14.093    9253      15     373      83   .077    4.1     49   71.6   48  10.0
5 19 HG       26    .280   13.64    135   13.948    7122      14     288      23   .057    1.2     29    6.4   14  16.0
6 16 HG       25    .320   13.71    345   14.057    9253      18     425      75   .077     .8     16    1.3    0  19.0
7  3 HG       38    .780   13.33   2426   14.151   21637      63    2409    1232   .113    1.4     33    5.8   14  16.0
8 16 HG       25    .270   13.78    384   14.077    9253      18     358      84   .077    7.1    272  139.2   92   3.0
9 C.T.      2079   2.790    8.23    108   13.265    3674     622    1561      10   .143    1.4     28    6.5   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------   88.9    223    1.4    0  22.2
1 IDLE        88   2.390   11.22    123   13.705    3538      25    1246      11   .232    5.1     44   10.9
2 16 HG       30    .300   13.67    324   14.002    9253      21     400      71   .077    5.7    289    2.4    0  15.1
3 10 HG       27    .170   13.37   1395   13.569   13971      30     354     477   .147    1.6     31    5.5   14  16.0
4 16 HG       22    .260   13.70    335   13.984    9253      16     348      74   .077    4.4     52   70.1   48  10.0
5 19 HG       23    .270   13.65    143   13.945    7122      13     279      24   .057    1.2     27    5.7   14  16.0
6 16 HG       25    .360   13.66    351   14.047    9253      18     479      77   .077     .7     16    1.4    0  19.0
7  3 HG       39    .810   13.33   2453   14.182   21637      64    2496    1242   .113    1.4     37    5.9   14  16.0
8 16 HG       25    .310   13.73    376   14.067    9253      18     412      82   .077    7.3    282  140.4   92   3.0
9 C.T.      2062   2.700    8.22    110   13.147    3674     622    1524      10   .143    1.4     32    6.3   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------   89.0    218    1.5    0  22.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------    5.1     45   10.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------    4.9     45   10.8
FOUR CYCLE COMPOSITE -                                                                       5.1     44   10.9
                                 HC- NDIR 0.35(     4.9) + 0.65(     5.1) =    5.032   GM/BHP HR
                                 CO- NDIR 0.35(    45.0) + 0.65(    44.4) =   44.644   GM/BHP HR
                                 NO2-NDIR 0.35(    10.8) + 0.65(    10.9) =   10.877   GM/BHP HR
                                                       CORRECTED NO2 =   11.245   GM/BHP HR
                                                                BSFC =     .912   LB/BHP HR
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             CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR        MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL  HP   VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE      2140   2.030   10.79     46   13.034    3538      58    1113       4   .232
2 16 HG      344    .440   13.55    300   14.024    9253      23     586      66   .077   13.5    258     .9    0  15.1
3 10 HG      353    .200   13.32   1375   13.555   13971      36     416     470   .147    1.8     45    5.1   14  16.0
4 16 HG      281    .340   13.67    350   14.038    9253      19     453      77   .077    5.4     61   69.2   48  10.0
5 19 HG      198    .330   13.59    100   13.940    7122      10     341      17   .057    1.4     35    5.9   14  16.0
6 16 HG      282    .320   13.71    340   14.058    9253      19     425      74   .077     .6     19    1.0    0  19.0
7  3 HG      926    .880   13.26   2313   14.233   21637     141    2702    1167   .113    1.4     33    5.7   14  16.0
8 16 HG      289    .290   13.78    315   14.099    9253      19     384      69   .077   15.9    305  131.9   92   3.0
9 C.T.     29532   2.810    8.21     37   13.973    3674     776    1492       3   .143    1.5     30    5.3   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------  111.0    213     .5    0  22.2
1 IDLE      2140   2.030   10.79     45   13.034    3538      58    1113       4   .232    6.9     45   10.3
2 16 HG      473    .370   13.67    337   14.087    9253      31     441      73   .077   13.5    258     .9    0  15.1
3 10 HG      324    .180   13.32   1363   13.532   13971      33     375     467   .147    2.4     34    5.7   14  16.0
4 16 HG      282    .270   13.74    313   14.038    9253      19     359      68   .077    4.9     55   68.7   48  10.0
5 19 HG      195    .320   13.64    100   13.980    7122      10     329      17   .057    1.4     28    5.2   14  16.0
6 16 HG      339    .390   13.68    325   14.104    9253      22     517      71   .077     .6     19    1.0    0  19.0
7  3 HG      967    .780   13.29   2375   14.167   21637     148    2406    1204   .113    1.7     40    5.5   14  16.0
8 16 HG      304    .260   13.78    340   14.070    9253      20     345      74   .077   16.7    272  136.1   92   3.0
9 C.T.     28665   2.790    8.29     28   13.946    3674     755    1485       2   .143    1.5     27    5.7   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------  108.0    212     .4    0  22.2
1 IDLE      2561   2.390   11.22     50   13.866    3538      65    1232       4   .232    6.9     43   10.4
2 16 HG      565    .320   13.74    250   14.117    9253      37     424      54   .077   15.2    286    1.0    0  15.1
3 10 HG      331    .160   13.38   1363   13.573   13971      34     333     466   .147    2.9     33    4.2   14  16.0
4 16 HG      354    .280   13.74    320   14.055    9253      23     372      70   .077    5.0     49   68.5   48  10.0
5 19 HG      332    .280   13.69    100   14.003    7122      17     288      17   .057    1.8     29    5.4   14  16.0
6 16 HG      339    .320   13.71    320   14.064    9253      22     425      70   .077    1.0     16    1.0    0  19.0
7  3 HG      976    .780   13.33   2400   14.208   21637     149    2400    1213   .113    1.7     33    5.4   14  16.0
8 16 HG      332    .270   13.78    320   14.083    9253      22     358      70   .077   16.8    271  137.1   92   3.0
9 C.T.     31515   2.790    8.23     35   14.172    3674     817    1461       3   .143    1.7     28    5.4   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------  116.8    209     .4    0  22.2
1 IDLE      2561   2.390   11.22     50   13.866    3538      65    1232       4   .232    7.4     43   10.4
2 16 HG      452    .300   13.67    285   14.015    9253      30     400      62   .077   15.2    286    1.0    0  15.1
3 10 HG      359    .170   13.37   1325   13.576   13971      37     353     453   .147    2.3     31    4.8   14  16.0
4 16 HG      325    .260   13.70    280   13.993    9253      22     347      61   .077    5.4     52   66.5   48  10.0
5 19 HG      252    .270   13.65     95   13.945    7122      13     279      16   .057    1.7     27    4.7   14  16.0
6 16 HG      360    .360   13.66    300   14.056    9253      24     479      66   .077     .7     16     .9    0  19.0
7  3 HG      961    .810   13.33   2400   14.236   21637     146    2487    1211   .113    1.8     37    5.0   14  16.0
8 16 HG      325    .310   13.73    320   14.073    9253      21     412      70   .077   16.5    281  136.8   92   3.0
9 C.T.     30388   2.700    8.22     35   13.959    3674     800    1436       3   .143    1.6     32    5.4   14  16.0
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------  114.4    205     .4    0  22.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------------    7.3     44   10.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------------    6.9     44   10.3
FOUR CYCLE COMPOSITE -                                                                       7.3     44   10.3
                                 HC- FID  0.35(     6.9) + 0.65(     7.3) =    7.177   GM/BHP HR
                                 CO- NDIR 0.35(    44.3) + 0.65(    43.6) =   43.861   GM/BHP HR
                                 NO2-CL   0.35(    10.3) + 0.65(    10.3) =   10.326   GM/BHP HR
                                                       CORRECTED NO2 =   10.676   GM/BHP HR
                                                                BSFC =     .912   LB/BHP HR
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                       TABLE F-10 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-0P   TEST 63  RUN-2   PARAMETRIC BASELINE    08-06-73      K =1.058      HUM = 96.2  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE        HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.   HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       96   1.650   12.89     91   14.699    3130     22     712      6    .232    5.1      165     1.5     0   13.9
2 16 MG      34    .330   14.12    283   14.486    8800     22     405     57    .077    1.7       31     4.4    14   16.0
3 10 MG      28    .300   13.82   1018   14.150   14152     30     606    338    .147    4.4       89    49.7    48   10.0
4 16 MG      33    .320   14.20    267   14.556    8800     22     391     54    .077    1.7       30     4.1    14   16.0
5 19 MG      28    .340   14.37    112   14.740    6804     14     317     17    .057     .8       18     1.0     0   19.0
6 16 MG      28    .350   14.24    269   14.620    8800     18     426     54    .077    1.4       33     4.1    14   16.0
7  3 MG      47    .840   13.75   1840   14.691   20956     73    2429    874    .113    8.2      274    98.8    91    3.0
8 16 MG      33    .420   14.24    261   14.696    8800     21     508     52    .077    1.6       39     4.0    14   16.0
9 C.T.     2211   2.470    9.31     86   14.188    3674    618    1292      7    .143   88.4      185     1.1     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.2       40     7.8
1 IDLE       96   1.650   12.89     91   14.699    3130     22     712      6    .232    5.1      165     1.5     0   13.9
2 16 MG      33    .520   14.19    261   14.796    8800     21     627     52    .077    1.6       48     4.0    14   16.0
3 10 MG      23    .250   13.83   1097   14.105   14152     25     507    349    .147    3.7       74    51.3    48   10.0
4 16 MG      23    .500   14.22    269   14.795    8800     15     603     51    .077    1.1       46     4.0    14   16.0
5 19 MG      14    .650   14.13    122   14.801    6804      9     609     19    .057     .5       34     1.1     0   19.0
6 16 MG      23    .640   14.18    267   14.845    8800     15     766     53    .077    1.1       59     4.0    14   16.0
7  3 MG      37    .810   13.73   1907   14.580   20956     57    2352    910    .113    6.5      266   102.8    91    3.0
8 16 MG      10    .500   14.24    272   14.751    8800      6     603     54    .077     .5       46     4.1    14   16.0
9 C.T.     2125   2.310    9.12     84   13.725    3674    619    1299      7    .143   87.9      179     1.1     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.0       42     8.0
1 IDLE      119   1.770   13.18     85   15.079    3130     27     742      6    .232    6.2      172     1.4     0   13.9
2 16 MG      43    .510   14.18    247   14.736    8800     28     615     49    .077    2.1       47     3.8    14   16.0
3 10 MG      34    .250   13.79   1116   14.077   14152     37     508    372    .147    5.4       75    54.6    48   10.0
4 16 MG      33    .490   14.25    235   14.776    8800     21     590     46    .077    1.6       45     3.6    14   16.0
5 19 MG      33    .890   14.10    121   15.026    6804     16     814     18    .057     .9       46     1.0     0   19.0
6 16 MG      33    .600   14.17    253   14.806    8800     21     720     50    .077    1.6       55     3.8    14   16.0
7  3 MG      48    .780   13.86   1970   14.692   20956     74    2247    933    .113    8.4      254   105.4    91    3.0
8 16 MG      27    .510   14.30    237   14.839    8800     17     611     47    .077    1.3       47     3.6    14   16.0
9 C.T.     2114   2.170    9.57     83   14.023    3674    598    1148      7    .143   85.5      164     1.0     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.2       42     8.2
1 IDLE      119   1.770   13.18     85   15.079    3130     27     742      6    .232    6.2      172     1.4     0   13.9
2 16 MG      24    .660   14.25    260   14.941    8800     18     785     51    .077    1.4       60     3.9    14   16.0
3 10 MG      24    .260   13.98   1024   14.266   14152     26     521    337    .147    3.8       77    49.6    48   10.0
4 16 MG      24    .460   14.33    262   14.816    8800     15     552     52    .077    1.2       42     4.0    14   16.0
5 19 MG      24    .550   14.37    100   14.946    6804     12     506     15    .057     .7       29      .9     0   19.0
6 16 MG      33    .640   14.16    248   14.836    8800     21     767     49    .077    1.6       59     3.8    14   16.0
7  3 MG      47    .730   13.92   1884   14.701   20956     72    2102    892    .113    8.2      238   100.8    91    3.0
8 16 MG      33    .570   14.19    263   14.796    8800     21     685     52    .077    1.6       53     4.0    14   16.0
9 C.T.     2034   2.070    9.69     79   13.862    3674    579    1100      6    .143   82.9      157      .9     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.0       41     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    5.1       41     7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    5.1       41     8.0
FOUR CYCLE COMPOSITE -
                                   HC- NDIR 0.35(     5.1) + 0.65(     5.1) =    5.107   GM/BHP HR
                                   CO- NDIR 0.35(    41.2) + 0.65(    41.5) =   41.375   GM/BHP HR
                                   NO2-NDIR 0.35(     7.9) + 0.65(     8.0) =    7.991   GM/BHP HR
                                                         CORRECTED NO2 =    8.452   GM/BHP HR
                                                                  BSFC =     .897   LB/BHP HR


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            CONCENTRATION AS MEASURED        TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR            MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO    NO2-CL  HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE      2689   1.650   12.89     40   14.809    3130     57     704      3    .232   13.2      163      .7     0   13.9
2 16 MG      248    .330   14.12    230   14.475    8800     15     405     46    .077    1.2       31     3.6    14   16.0
3 10 MG      261    .300   13.82   1000   14.146   14152     26     606    332    .147    3.8       89    48.8    48   10.0
4 16 MG      248    .320   14.20    230   14.545    8800     15     391     46    .077    1.2       30     3.6    14   16.0
5 19 MG      249    .340   14.37     75   14.735    6804     11     317     11    .057     .7       18      .7     0   19.0
6 16 MG      270    .350   14.24    230   14.617    8800     16     426     46    .077    1.3       33     3.5    14   16.0
7  3 MG     1036    .840   13.75   1850   14.644   20956    148    2420    876    .113   16.7      273    99.0    91    3.0
8 16 MG      299    .420   14.24    225   14.690    8800     18     508     45    .077    1.4       39     3.4    14   16.0
9 C.T.     28838   2.470    9.33     20   14.684    3674    722    1248      2    .143  103.2      179      .2     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.6       40     7.6
1 IDLE      2689   1.650   12.89     40   14.809    3130     57     704      3    .232   13.2      163      .7     0   13.9
2 16 MG      518    .520   14.19    235   14.762    8800     31     626     47    .077    2.4       48     3.6    14   16.0
3 10 MG      311    .250   13.83   1050   14.111   14152     31     506    350    .147    4.6       74    51.4    48   10.0
4 16 MG      390    .500   14.22    235   14.759    8800     23     602     47    .077    1.8       46     3.6    14   16.0
5 19 MG      356    .650   14.13     70   14.816    6804     16     603     11    .057     .9       34      .6     0   19.0
6 16 MG      413    .640   14.18    240   14.861    8800     24     766     47    .077    1.9       59     3.6    14   16.0
7  3 MG     1078    .810   13.73   1925   14.648   20956    154    2341    914    .113   17.4      265   103.3    91    3.0
8 16 MG      412    .500   14.24    237   14.781    8800     25     601     47    .077    1.9       46     3.6    14   16.0
9 C.T.     31403   2.310    9.12     20   14.570    3674    792    1177      2    .143  113.2      168      .2     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    7.3       42     7.9
1 IDLE      4155   1.770   13.18     40   15.365    3130     85     728      3    .232   19.6      169      .6     0   13.9
2 16 MG      448    .510   14.18    235   14.740    8800     30     615     47    .077    2.3       47     3.6    14   16.0
3 10 MG      284    .250   13.79   1087   14.069   14152     29     508    363    .147    4.3       75    53.4    48   10.0
4 16 MG      448    .490   14.25    210   14.785    8800     27     589     41    .077    2.1       45     3.2    14   16.0
5 19 MG      519    .890   14.10     75   15.092    6804     23     813     11    .057    1.3       46      .6     0   19.0
6 16 MG      476    .600   14.17    220   14.818    8800     28     720     43    .077    2.2       55     3.3    14   16.0
7  3 MG     1150    .780   13.86   1950   14.755   20956    163    2238    919    .113   18.5      253   103.9    91    3.0
8 16 MG      370    .510   14.30    210   14.847    8800     22     611     41    .077    1.7       47     3.2    14   16.0
9 C.T.     31041   2.170    9.57     20   14.844    3674    768    1095      2    .143  109.9      155      .2     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    7.5       41     8.0
1 IDLE      4155   1.770   13.18     40   15.365    3130     85     728      3    .232   19.6      169      .6     0   13.9
2 16 MG      576    .660   14.25    220   14.968    8800     34     784     43    .077    2.6       60     3.3    14   16.0
3 10 MG      261    .260   13.98   1037   14.266   14152     26     521    342    .147    3.8       77    50.2    48   10.0
4 16 MG      363    .460   14.33    225   14.826    8800     22     552     44    .077    1.7       42     3.4    14   16.0
5 19 MG      285    .550   14.37     80   14.948    6804     13     506     12    .057     .7       29      .7     0   19.0
6 16 MG      455    .640   14.16    200   14.845    8800     27     766     39    .077    2.1       59     3.0    14   16.0
7  3 MG     1022    .730   13.92   1908   14.752   20956    145    2095    900    .113   16.4      237   101.7    91    3.0
8 16 MG      369    .570   14.19    224   14.797    8800     22     685     44    .077    1.7       53     3.4    14   16.0
9 C.T.     30602   2.070    9.69     20   14.820    3674    759    1037      2    .143  108.5      148      .2     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    7.3       40     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    6.9       41     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    7.4       41     7.8
FOUR CYCLE COMPOSITE -
                                   HC- FID  0.35(     6.9) + 0.65(     7.4) =    7.216   GM/BHP HR
                                   CO- NDIR 0.35(    40.7) + 0.65(    40.8) =   40.788   GM/BHP HR
                                   NO2-CL   0.35(     7.7) + 0.65(     7.8) =    7.790   GM/BHP HR
                                                         CORRECTED NO2 =    8.239   GM/BHP HR
                                                                  BSFC =     .897   LB/BHP HR
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                        TABLE F-11 MASS EMISSIONS BY NINE-MODE FTP
ENGINE-6-UP  TEST-79  RUN-2   PARAMETRIC BASELINE   08-24-73      K =1.076     HUM =104.9  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE          HC       CO      CO2       NO     CARBON    CONS.      HC        CO      NO2     FACT.    HC          CO      NO2     HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE        183    1.550    12.56     116     14.308     3493      48       764        9     .232     11.2        177      2.2      0     19.6
2 16 HG        73     .360    13.77     304     14.204     8981      50       460       64     .077      3.8         35      4.9     15     16.0
3 10 HG        60     .380    13.60    1221     14.095    19152      65       773      408     .147      9.6        114     60.0     47     10.0
4 16 HG        55     .430    13.87     326     14.359     8981      37       543       68     .077      2.9         42      5.2     15     16.0
5 19 HG        49     .300    13.94     147     14.293     7575      28       321       26     .057      1.6         18      1.5      0     19.0
6 16 HG        49     .280    13.89     346     14.223     8981      33       357       73     .077      2.6         28      5.6     15     16.0
7  3 HG        66     .860    13.49    2280     14.421    21727     107      2617     1140     .113     12.1        296    128.9     93      3.0
8 16 HG        46     .310    14.06     369     14.420     8981      31       390       76     .077      2.4         30      5.9     15     16.0
9 C.T.       1555    2.650     9.94      94     14.269     3720     438      1396        9     .143     62.6        200      1.2      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.9         42      9.7
1 IDLE        183    1.550    12.56     116     14.308     3493      48       764        9     .232     11.2        177      2.2      0     19.6
2 16 HG        49     .320    14.01     307     14.383     8981      33       404       64     .077      2.5         31      4.9     15     16.0
3 10 HG        42     .240    13.86    1250     14.145    19152      45       485      415     .147      6.7         71     61.0     47     10.0
4 16 HG        42     .330    14.15     349     14.525     8981      28       412       72     .077      2.2         32      5.5     15     16.0
5 19 HG        39     .390    14.17     151     14.602     7575      22       409       26     .057      1.2         23      1.5      0     19.0
6 16 HG        39     .280    14.01     323     14.332     8981      26       354       67     .077      2.0         27      5.2     15     16.0
7  3 HG        61     .850    13.68    2444     14.596    21727      98      2556     1208     .113     11.1        289    136.5     93      3.0
8 16 HG        39     .310    14.10     347     14.452     8981      26       389       72     .077      2.0         30      5.5     15     16.0
9 C.T.       1413    2.580    10.12      96     14.226     3720     399      1363        8     .143     57.1        195      1.2      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.3         39     10.1
1 IDLE        237    1.700    12.72     102     14.676     3493      61       817        8     .232     14.1        190      1.9      0     19.6
2 16 HG        47     .380    13.98     320     14.411     8981      32       478       66     .077      2.4         37      5.1     15     16.0
3 10 HG        36     .150    13.73    1267     13.919    19152      40       308      428     .147      5.8         45     62.9     47     10.0
4 16 HG        37     .350    13.98     316     14.370     8981      25       442       66     .077      1.9         34      5.0     15     16.0
5 19 HG        36     .390    14.12     148     14.549     7575      20       410       26     .057      1.2         23      1.5      0     19.0
6 16 HG        37     .360    13.97     310     14.370     8981      25       454       64     .077      1.9         35      5.0     15     16.0
7  3 HG        63     .940    13.63    2406     14.638    21727     101      2810     1186     .113     11.4        318    134.0     93      3.0
8 16 HG        37     .370    14.07     337     14.480     8981      25       464       69     .077      1.9         36      5.3     15     16.0
9 C.T.       1481    2.480    10.10      92     14.179     3720     420      1314        8     .143     60.0        188      1.1      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.5         41     10.0
1 IDLE        237    1.700    12.72     102     14.676     3493      61       817        8     .232     14.1        190      1.9      0     19.6
2 16 HG        45     .290    14.03     311     14.369     8981      30       366       65     .077      2.3         28      5.0     15     16.0
3 10 HG        35     .180    13.73    1245     13.948    19152      38       369      419     .147      5.6         54     61.7     47     10.0
4 16 HG        37     .360    14.00     327     14.400     8981      25       454       68     .077      1.9         35      5.2     15     16.0
5 19 HG        35     .270    14.10     146     14.408     7575      20       287       25     .057      1.1         16      1.5      0     19.0
6 16 HG        35     .260    14.12     341     14.418     8981      24       327       71     .077      1.8         25      5.4     15     16.0
7  3 HG        58     .770    13.67    2538     14.503    21727      94      2330     1262     .113     10.6        263    142.6     93      3.0
8 16 HG        35     .330    14.06     340     14.428     8981      24       415       70     .077      1.8         32      5.4     15     16.0
9 C.T.       1418    2.300    10.22      97     14.051     3720     405      1230        9     .143     58.0        176      1.2      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      4.4         37     10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      4.6         41      9.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      4.5         39     10.2
FOUR CYCLE COMPOSITE -                     HC- NDIR 0.35(      4.6) + 0.65(      4.5) =     4.516   GM/BHP HR
                                           CO- NDIR 0.35(     40.9) + 0.65(     38.9) =    39.589   GM/BHP HR
                                           NO2-NDIR 0.35(      9.9) + 0.65(     10.2) =    10.075   GM/BHP HR
                                                              CORRECTED NO2 =    10.839   GM/BHP HR
                                                                       BSFC =      .902   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                 MAN.
MODE         HC-FID    CO      CO2    NO-CL     CARBON    CONS.      HC        CO      NO2     FACT.   HC-FID       CO    NO2-CL    HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE       3222    1.550    12.56      45     14.432     3493      78       758        4     .232     18.1        176       .8      0     19.6
2 16 HG       311     .360    13.77     265     14.161     8981      20       461       56     .077      1.5         36      4.3     15     16.0
3 10 HG       198     .380    13.60    1137     14.000    19152      20       776      382     .147      2.9        114     56.1     47     10.0
4 16 HG       368     .430    13.87     300     14.337     8981      23       544       62     .077      1.8         42      4.8     15     16.0
5 19 HG       255     .300    13.94     125     14.265     7575      14       322       22     .057       .8         18      1.3      0     19.0
6 16 HG       226     .280    13.89     312     14.193     8981      14       358       66     .077      1.1         28      5.0     15     16.0
7  3 HG       991     .860    13.49    2325     14.449    21727     149      2612     1161     .113     16.8        295    131.2     93      3.0
8 16 HG       227     .310    14.06     325     14.393     8981      14       391       67     .077      1.1         30      5.2     15     16.0
9 C.T.      25009    2.650     9.94      20     15.091     3720     616      1320        2     .143     88.2        189       .2      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      6.0         42      9.4
1 IDLE       3222    1.550    12.56      45     14.432     3493      78       758        4     .232     18.1        176       .8      0     19.6
2 16 HG       396     .320    14.01     275     14.370     8981      25       404       57     .077      1.9         31      4.4     15     16.0
3 10 HG       283     .240    13.86    1175     14.128    19152      28       486      391     .147      4.2         71     57.4     47     10.0
4 16 HG       312     .330    14.15     300     14.511     8981      19       413       62     .077      1.5         32      4.7     15     16.0
5 19 HG       255     .390    14.17     125     14.586     7575      13       409       22     .057       .8         23      1.2      0     19.0
6 16 HG       255     .280    14.01     300     14.315     8981      16       355       62     .077      1.2         27      4.8     15     16.0
7  3 HG      1163     .850    13.68    2450     14.646    21727     172      2547     1207     .113     19.5        288    136.4     93      3.0
8 16 HG       312     .310    14.10     325     14.441     8981      19       389       67     .077      1.5         30      5.2     15     16.0
9 C.T.      24584    2.580    10.12      24     15.158     3720     603      1279        2     .143     86.3        183       .3      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      6.1         39      9.7
1 IDLE       4137    1.700    12.72      52     14.834     3493      97       809        4     .232     22.6        188       .9      0     19.6
2 16 HG       425     .380    13.98     290     14.402     8981      26       479       60     .077      2.0         37      4.6     15     16.0
3 10 HG       226     .150    13.73    1175     13.903    19152      23       308      397     .147      3.4         45     58.4     47     10.0
4 16 HG       283     .350    13.98     300     14.358     8981      18       442       62     .077      1.4         34      4.8     15     16.0
5 19 HG       227     .390    14.12     125     14.533     7575      12       411       22     .057       .7         23      1.2      0     19.0
6 16 HG       311     .360    13.97     287     14.361     8981      19       455       60     .077      1.5         35      4.6     15     16.0
7  3 HG      1305     .940    13.63    2287     14.700    21727     193      2806     1122     .113     21.8        317    126.8     93      3.0
8 16 HG       312     .370    14.07     325     14.471     8981      19       464       67     .077      1.5         36      5.2     15     16.0
9 C.T.      26349    2.480    10.10      23     15.215     3720     644      1225        2     .143     92.1        175       .3      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      6.6         40      9.3
1 IDLE       4137    1.700    12.72      52     14.834     3493      97       809        4     .232     22.6        188       .9      0     19.6
2 16 HG       425     .290    14.03     280     14.362     8981      27       366       58     .077      2.0         28      4.5     15     16.0
3 10 HG       254     .180    13.73    1200     13.935    19152      26       369      405     .147      3.8         54     59.5     47     10.0
4 16 HG       227     .360    14.00     312     14.383     8981      14       454       65     .077      1.1         35      5.0     15     16.0
5 19 HG       227     .270    14.10     113     14.393     7575      12       287       20     .057       .7         16      1.1      0     19.0
6 16 HG       312     .260    14.12     300     14.411     8981      19       327       62     .077      1.5         25      4.8     15     16.0
7  3 HG      1219     .770    13.67    2550     14.562    21727     182      2321     1263     .113     20.5        262    142.7     93      3.0
8 16 HG       255     .330    14.06     350     14.415     8981      16       415       72     .077      1.2         32      5.6     15     16.0
9 C.T.      24994    2.300    10.22      23     15.019     3720     619      1151        2     .143     88.5        165       .3      0     22.3
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      6.4         36     10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      6.0         40      9.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      6.5         38      9.7
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(      6.0) + 0.65(      6.5) =     6.338   GM/BHP HR
                                           CO- NDIR 0.35(     40.3) + 0.65(     38.2) =    38.937   GM/BHP HR
                                           NO2-CL   0.35(      9.6) + 0.65(      9.7) =     9.659   GM/BHP HR
                                                              CORRECTED NO2 =    10.392   GM/BHP HR
                                                                       BSFC =      .902   LB/BHP HR
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                         TABLE F-12 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-DP  TEST 79  RUN-5  PARAMETRIC BASELINE   08-29-73     K =1.020     HUM = 81.8  GR/LB
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           CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE        HC      CO     CO2     NO    CARBON   CONS.      HC      CO    NO2   FACT.    HC       CO     NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE     124   2.210   12.56    117   14.904    3493      31    1046      9   .232    7.3     243     2.1    0   19.6
2 16 MG     31    .320   14.01    393   14.363    8981      21     409     82   .077    1.6      31     6.3   15   16.0
3 10 MG     30    .230   13.68   1961   13.942   14152      33     472    492   .147    4.8      69    72.4   47   10.0
4 16 MG     29    .340   14.10    408   14.471    8981      19     426     84   .077    1.5      33     6.5   15   16.0
5 19 MG     42    .450   14.13    152   14.625    7575      23     471     26   .057    1.3      27     1.5    0   19.0
6 16 MG     30    .390   14.02    394   14.442    8981      20     490     81   .077    1.6      38     6.3   15   16.0
7  3 MG     67    .830   13.73   2601   14.632   21727     107    2490   1282   .113   12.1     281   144.9   93    3.0
8 16 MG     42    .370   14.14    416   14.555    8981      28     461     85   .077    2.2      36     6.6   15   16.0
9 C.T.    1681   2.440    9.89     47   14.145    3720     477    1296      8   .143   68.3     185     1.2    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    4.5      42    11.2
1 IDLE     124   2.210   12.56    117   14.904    3493      31    1046      9   .232    7.3     243     2.1    0   19.6
2 16 MG     39    .400   14.04    380   14.482    8981      26     501     78   .077    2.0      39     6.0   15   16.0
3 10 MG     29    .240   13.67   1912   13.941   14152      32     492    510   .147    4.7      72    74.9   47   10.0
4 16 MG     45    .410   14.01    384   14.469    8981      30     514     79   .077    2.3      40     6.1   15   16.0
5 19 MG     30    .370   14.15    150   14.552    7575      17     389     26   .057    1.0      22     1.5    0   19.0
6 16 MG     41    .380   14.03    410   14.454    8981      28     477     85   .077    2.1      37     6.5   15   16.0
7  3 MG     61    .750   13.65   2741   14.466   21727      99    2275   1367   .113   11.2     257   154.4   93    3.0
8 16 MG     26    .420   14.10    394   14.548    8981      17     524     81   .077    1.3      40     6.2   15   16.0
9 C.T.    1681   2.480    9.83     49   14.125    3720     478    1319      9   .143   68.4     189     1.2    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    4.5      42    11.7
1 IDLE     216   1.560   12.58    109   14.379    3493      57     766      9   .232   13.2     178     2.0    0   19.6
2 16 MG     70    .440   14.00    363   14.516    8981      47     550     75   .077    3.6      42     5.7   15   16.0
3 10 MG     46    .200   13.67   1965   13.920   14152      51     411    494   .147    7.4      60    72.7   47   10.0
4 16 MG     40    .520   13.89    371   14.453    8981      27     653     77   .077    2.1      50     5.9   15   16.0
5 19 MG     32    .340   14.09    149   14.465    7575      18     360     26   .057    1.0      21     1.5    0   19.0
6 16 MG     24    .340   14.04    373   14.406    8981      16     428     77   .077    1.2      33     5.9   15   16.0
7  3 MG     56    .820   13.61   2702   14.490   21727      91    2484   1345   .113   10.2     281   152.0   93    3.0
8 16 MG     43    .360   14.12    397   14.526    8981      29     460     81   .077    2.2      35     6.3   15   16.0
9 C.T.    1651   2.350    9.96    100   14.093    3720     471    1253      9   .143   67.3     179     1.3    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    4.9      40    11.4
1 IDLE     216   1.560   12.58    109   14.373    3493      57     766      9   .232   13.2     178     2.0    0   19.6
2 16 MG     74    .370   14.00    358   14.450    8981      50     465     74   .077    3.8      36     5.7   15   16.0
3 10 MG     67    .180   13.63   1986   13.882   14152      74     371    503   .147   10.8      54    73.9   47   10.0
4 16 MG     70    .320   14.03    362   14.426    8981      47     402     75   .077    3.6      31     5.8   15   16.0
5 19 MG     68    .310   14.15    151   14.533    7575      38     326     26   .057    2.2      19     1.5    0   19.0
6 16 MG     68    .360   14.02    380   14.453    8981      46     452     78   .077    3.5      35     6.0   15   16.0
7  3 MG     92    .860   13.58   2678   14.539   21727     149    2596   1329   .113   16.8     293   150.1   93    3.0
8 16 MG     72    .400   14.03    374   14.508    8981      48     500     77   .077    3.7      39     5.9   15   16.0
9 C.T.    1780   2.330    9.76    109   14.012    3720     510    1250      9   .143   73.0     179     1.3    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    5.9      39    11.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    4.5      42    11.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    5.4      39    11.4
FOUR CYCLE COMPOSITE -
                               HC- NDIR 0.35(    4.5) + 0.65(    5.4) =    5.083   GM/BHP HR
                               CO- NDIR 0.35(   42.4) + 0.65(   39.2) =   40.336   GM/BHP HR
                               NO2-NDIR 0.35(   11.4) + 0.65(   11.4) =   11.400   GM/BHP HR
                                                   CORRECTED NO2 =   11.633   GM/BHP HR
                                                            BSFC =     .902   LB/BHP HR


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           CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE      HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO    NO2   FACT.  HC-FID     CO   NO2-CL   HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE    3012   2.210   12.56     60   15.071    3493      70    1035      5   .232   16.2     240     1.1    0   19.6
2 16 MG    290    .320   14.01    350   14.359    8981      18     409     73   .077    1.4      31     5.6   15   16.0
3 10 MG    240    .230   13.68   1950   13.934   14152      24     472    489   .147    3.6      69    71.9   47   10.0
4 16 MG    234    .340   14.10    370   14.463    8981      15     426     76   .077    1.1      33     5.9   15   16.0
5 19 MG    187    .450   14.13    115   14.599    7575      10     472     20   .057     .6      27     1.1    0   19.0
6 16 MG    271    .390   14.02    360   14.437    8981      17     490     74   .077    1.3      38     5.7   15   16.0
7  3 MG   1060    .830   13.73   2700   14.666   21727     157    2484   1328   .113   17.7     281   150.1   93    3.0
8 16 MG    312    .370   14.14    370   14.541    8981      19     462     76   .077    1.5      36     5.8   15   16.0
9 C.T.   25623   2.440    9.89     40   14.892    3720     640    1231      3   .143   91.6     176      .5    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    6.1      42    11.2
1 IDLE    3012   2.210   12.56     60   15.071    3493      70    1035      5   .232   16.2     240     1.1    0   19.6
2 16 MG    415    .400   14.04    340   14.481    8981      26     501     70   .077    2.0      39     5.4   15   16.0
3 10 MG    264    .240   13.67   1950   13.936   14152      27     492    489   .147    3.9      72    71.9   47   10.0
4 16 MG    305    .410   14.01    360   14.450    8981      19     515     74   .077    1.5      40     5.7   15   16.0
5 19 MG    180    .370   14.15    115   14.538    7575       9     389     20   .057     .5      22     1.1    0   19.0
6 16 MG    347    .380   14.03    375   14.445    8981      22     477     77   .077    1.7      37     6.0   15   16.0
7  3 MG   1105    .750   13.65   2750   14.510   21727     165    2268   1367   .113   18.7     256   154.5   93    3.0
8 16 MG    354    .420   14.10    360   14.555    8981      22     523     74   .077    1.7      40     5.7   15   16.0
9 C.T.   25619   2.480    9.83     40   14.872    3720     641    1253      3   .143   91.6     179      .5    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    6.2      42    11.3
1 IDLE    4014   1.560   12.58     60   14.541    3493      96     757      5   .232   22.4     176     1.1    0   19.6
2 16 MG    503    .440   14.00    310   14.490    8981      31     551     64   .077    2.4      42     4.9   15   16.0
3 10 MG    219    .200   13.67   1925   13.892   14152      22     412    482   .147    3.3      60    70.8   47   10.0
4 16 MG    287    .520   13.89    345   14.439    8981      18     653     71   .077    1.4      50     5.5   15   16.0
5 19 MG    283    .340   14.09    115   14.458    7575      15     360     20   .057     .8      21     1.1    0   19.0
6 16 MG    337    .340   14.04    345   14.414    8981      21     428     71   .077    1.6      33     5.5   15   16.0
7  3 MG   1165    .820   13.61   2775   14.547   21727     174    2474   1376   .113   19.7     280   155.5   93    3.0
8 16 MG    362    .360   14.12    365   14.516    8981      22     450     75   .077    1.7      35     5.8   15   16.0
9 C.T.   25619   2.350    9.96     40   14.872    3720     641    1187      3   .143   91.6     170      .5    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    6.5      39    11.3
1 IDLE    4014   1.560   12.58     60   14.541    3493      96     757      5   .232   22.4     176     1.1    0   19.6
2 16 MG    425    .370   14.00    320   14.412    8981      26     466     66   .077    2.0      36     5.1   15   16.0
3 10 MG    240    .180   13.63   1950   13.834   14152      25     372    492   .147    3.6      55    72.4   47   10.0
4 16 MG    295    .320   14.03    330   14.379    8981      15     404     68   .077    1.2      31     5.3   15   16.0
5 19 MG    198    .310   14.15    115   14.480    7575      10     328     20   .057     .6      19     1.1    0   19.0
6 16 MG    243    .360   14.02    345   14.404    8981      18     453     71   .077    1.4      35     5.5   15   16.0
7  3 MG   1183    .860   13.58   2675   14.558   21727     177    2593   1325   .113   20.0     293   149.8   93    3.0
8 16 MG    354    .400   14.03    340   14.465    8981      22     502     70   .077    1.7      39     5.4   15   16.0
9 C.T.   27573   2.330    9.76     45   14.847    3720     691    1179      4   .143   98.8     169      .5    0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    6.8      38    11.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    6.1      42    11.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    6.7      39    11.2
FOUR CYCLE COMPOSITE -
                               HC- FID  0.35(    6.1) + 0.65(    6.7) =    6.493   GM/BHP HR
                               CO- NDIR 0.35(   41.8) + 0.65(   38.7) =   39.784   GM/BHP HR
                               NO2-CL   0.35(   11.3) + 0.65(   11.2) =   11.216   GM/BHP HR
                                                   CORRECTED NO2 =   11.444   GM/BHP HR
                                                            BSFC =     .902   LB/BHP HR
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TABLE F-13 MASS EMISSIONS BY NINE-MODE FTP

ENGINE 6-OP   TEST-56   RUN-2   TIMING 12 BTDC   07-25-73   K =1.050   HUM = 92.8 GR/LB

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC	CO	CO2	NO	CARBON	CONS.	HC	CO	NO2	FACT.	HC	CO	NO2	HP	VAC.
1 IDLE	101	1.510	12.76	109	14.379	3447	26	731	9	.232	6.1	170	2.0	0	19.9
2 16 HG	34	.390	14.23	353	14.657	9299	23	500	74	.077	1.8	38	5.7	17	16.0
3 10 HG	30	.240	13.70	1431	13.972	13971	32	485	475	.147	4.8	71	69.8	51	10.0
4 16 HG	29	.400	14.31	412	14.741	9299	20	510	86	.077	1.5	39	6.6	17	16.0
5 19 HG	31	.470	14.38	151	14.883	7938	18	506	27	.057	1.0	29	1.5	0	19.0
6 16 HG	27	.400	14.34	398	14.769	9299	18	509	83	.077	1.4	39	6.4	17	16.0
7 3 HG	47	.840	13.72	2545	14.611	22000	76	2555	1272	.113	8.6	289	143.8	93	3.0
8 16 HG	30	.410	14.33	398	14.772	9299	20	521	83	.077	1.6	40	6.4	17	16.0
9 C.T.	2506	2.600	9.26	108	14.566	3447	640	1243	8	.143	91.6	178	1.2	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											5.1	38	10.5		
1 IDLE	101	1.510	12.76	109	14.379	3447	26	731	9	.232	6.1	170	2.0	0	19.9
2 16 HG	41	.390	14.28	338	14.714	9299	28	498	71	.077	2.2	38	5.5	17	16.0
3 10 HG	33	.280	13.78	1509	14.096	13971	35	561	497	.147	5.2	82	73.0	51	10.0
4 16 HG	31	.420	14.28	377	14.733	9299	21	535	79	.077	1.6	41	6.1	17	16.0
5 19 HG	31	.480	14.39	147	14.903	7938	18	516	26	.057	1.0	29	1.5	0	19.0
6 16 HG	33	.380	14.27	430	14.686	9299	23	486	90	.077	1.7	37	7.0	17	16.0
7 3 HG	48	.730	13.78	2617	14.562	22000	78	2228	1313	.113	8.9	252	148.3	93	3.0
8 16 HG	31	.340	14.36	364	14.733	9299	21	433	76	.077	1.6	33	5.9	17	16.0
9 C.T.	2519	2.670	9.22	108	14.611	3447	642	1272	8	.143	91.8	182	1.2	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											5.2	37	10.7		
1 IDLE	125	2.180	12.87	111	15.185	3447	31	1000	8	.232	7.1	232	1.9	0	19.9
2 16 HG	40	.420	14.16	362	14.623	9299	27	540	76	.077	2.1	42	5.9	17	16.0
3 10 HG	34	.270	13.80	1461	14.107	13971	36	540	480	.147	5.3	79	70.6	51	10.0
4 16 HG	32	.380	14.31	358	14.725	9299	22	485	75	.077	1.7	37	5.8	17	16.0
5 19 HG	29	.380	14.38	147	14.791	7938	17	412	26	.057	1.0	23	1.5	0	19.0
6 16 HG	32	.360	14.28	375	14.675	9299	22	461	79	.077	1.7	35	6.1	17	16.0
7 3 HG	48	.770	13.76	2559	14.582	22000	78	2347	1282	.113	8.8	265	144.8	93	3.0
8 16 HG	33	.420	14.20	351	14.656	9299	23	538	74	.077	1.7	41	5.7	17	16.0
9 C.T.	2641	.610	9.17	108	12.632	3447	778	336	10	.143	111.3	48	1.4	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											6.0	35	10.5		
1 IDLE	125	2.180	12.87	111	15.185	3447	31	1000	8	.232	7.1	232	1.9	0	19.9
2 16 HG	43	.420	14.23	401	14.696	9299	29	537	84	.077	2.3	41	6.5	17	16.0
3 10 HG	35	.240	13.67	1456	13.948	13971	38	486	484	.147	5.6	71	71.2	51	10.0
4 16 HG	32	.380	14.23	376	14.645	9299	22	487	79	.077	1.7	38	6.1	17	16.0
5 19 HG	32	.430	14.32	140	14.785	7938	19	466	25	.057	1.1	27	1.4	0	19.0
6 16 HG	32	.390	14.14	357	14.565	9299	22	503	76	.077	1.7	39	5.8	17	16.0
7 3 HG	50	.720	13.69	2648	14.464	22000	82	2212	1337	.113	9.3	250	151.1	93	3.0
8 16 HG	33	.370	14.21	384	14.616	9299	23	476	81	.077	1.7	37	6.2	17	16.0
9 C.T.	2472	2.530	9.40	117	14.600	3447	630	1207	9	.143	90.1	173	1.3	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											5.2	39	10.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											5.1	38	10.6		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											5.6	37	10.6		

FOUR CYCLE COMPOSITE -

HC- NDIR 0.35(5.1) + 0.65(5.6) = 5.436 GM/BHP HR
CO- NDIR 0.35(37.7) + 0.65(36.7) = 37.071 GM/BHP HR
NO2-NDIR 0.35(10.6) + 0.65(10.6) = 10.620 GM/BHP HR
CORRECTED NO2 = 11.148 GM/BHP HR
BSFC = .866 LB/BHP HR

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC-FID	CO	CO2	NO-CL	CARBON	CONS.	HC	CO	NO2	FACT.	HC-FID	CO	NO2-CL	HP	VAC.
1 IDLE	2513	1.510	12.76	50	14.521	3447	60	724	4	.232	13.8	168	.9	0	19.9
2 16 HG	501	.390	14.23	305	14.670	9299	32	499	64	.077	2.4	38	4.9	17	16.0
3 10 HG	468	.240	13.70	1375	13.986	13971	46	484	456	.147	6.8	71	67.0	51	10.0
4 16 HG	451	.400	14.31	362	14.755	9299	28	509	76	.077	2.2	39	5.8	17	16.0
5 19 HG	348	.470	14.38	100	14.885	7938	19	506	18	.057	1.1	29	1.0	0	19.0
6 16 HG	373	.400	14.34	355	14.777	9299	23	508	74	.077	1.8	39	5.7	17	16.0
7 3 HG	1036	.840	13.72	2388	14.664	22000	155	2546	1189	.113	17.6	288	134.4	93	3.0
8 16 HG	394	.410	14.33	350	14.779	9299	25	521	73	.077	1.9	40	5.6	17	16.0
9 C.T.	29962	2.600	9.26	30	14.856	3447	695	1219	2	.143	99.4	174	.3	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											6.3	38	9.7		
1 IDLE	2513	1.510	12.76	50	14.521	3447	60	724	4	.232	13.8	168	.9	0	19.9
2 16 HG	611	.390	14.28	300	14.731	9299	39	497	63	.077	3.0	38	4.8	17	16.0
3 10 HG	467	.280	13.78	1450	14.107	13971	46	560	477	.147	6.8	82	70.1	51	10.0
4 16 HG	461	.420	14.28	338	14.746	9299	29	535	71	.077	2.2	41	5.4	17	16.0
5 19 HG	356	.480	14.39	113	14.906	7938	19	516	20	.057	1.1	29	1.1	0	19.0
6 16 HG	441	.380	14.27	375	14.694	9299	28	486	79	.077	2.1	37	6.1	17	16.0
7 3 HG	964	.730	13.78	2500	14.606	22000	145	2221	1250	.113	16.4	251	141.3	93	3.0
8 16 HG	426	.340	14.36	325	14.743	9299	27	433	68	.077	2.1	33	5.2	17	16.0
9 C.T.	30419	2.670	9.22	50	14.931	3447	702	1245	4	.143	100.4	178	.5	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											6.4	37	10.1		
1 IDLE	3503	2.180	12.87	63	15.400	3447	78	986	5	.232	18.2	229	1.1	0	19.9
2 16 HG	653	.420	14.16	325	14.645	9299	41	539	69	.077	3.2	41	5.3	17	16.0
3 10 HG	480	.270	13.80	1425	14.118	13971	48	540	468	.147	7.0	79	68.8	51	10.0
4 16 HG	426	.380	14.31	300	14.733	9299	27	484	63	.077	2.1	37	4.8	17	16.0
5 19 HG	299	.380	14.38	113	14.790	7938	16	412	20	.057	.9	23	1.1	0	19.0
6 16 HG	426	.360	14.28	363	14.683	9299	27	461	76	.077	2.1	35	5.9	17	16.0
7 3 HG	1007	.770	13.76	2500	14.631	22000	151	2339	1248	.113	17.1	264	141.0	93	3.0
8 16 HG	454	.420	14.20	450	14.665	9299	29	538	95	.077	2.2	41	7.3	17	16.0
9 C.T.	41438	.610	9.17	38	13.924	3447	1026	305	3	.143	146.7	44	.4	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											8.6	34	10.1		
1 IDLE	3503	2.180	12.87	63	15.400	3447	78	986	5	.232	18.2	229	1.1	0	19.9
2 16 HG	653	.420	14.23	350	14.716	9299	41	536	73	.077	3.2	41	5.7	17	16.0
3 10 HG	458	.240	13.67	1400	13.956	13971	46	485	465	.147	6.7	71	68.4	51	10.0
4 16 HG	426	.380	14.23	338	14.653	9299	27	487	71	.077	2.1	38	5.5	17	16.0
5 19 HG	341	.430	14.32	100	14.784	7938	18	466	18	.057	1.0	27	1.0	0	19.0
6 16 HG	412	.390	14.14	325	14.571	9299	26	503	69	.077	2.0	39	5.3	17	16.0
7 3 HG	998	.720	13.69	2500	14.510	22000	151	2205	1258	.113	17.1	249	142.2	93	3.0
8 16 HG	412	.370	14.21	325	14.621	9299	26	475	69	.077	2.0	37	5.3	17	16.0
9 C.T.	30646	2.530	9.40	50	14.995	3447	704	1175	4	.143	100.7	168	.5	0	22.3
CYCLE COMPOSITE IN GM/BHP HR											6.6	39	10.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											6.3	37	9.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											7.6	36	10.1		

FOUR CYCLE COMPOSITE -

HC- FID 0.35(6.3) + 0.65(7.6) = 7.134 GM/BHP HR
CO- NDIR 0.35(37.5) + 0.65(36.3) = 36.730 GM/BHP HR
NO2-CL 0.35(9.9) + 0.65(10.1) = 10.033 GM/BHP HR
CORRECTED NO2 = 10.532 GM/BHP HR
BSFC = .866 LB/BHP HR

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                         TABLE F-14 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-56  RUN 1   TIMING TDC               07-25-73      K =1.051     HUM = 93.4  GR/LB
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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
               HC      CO     CO2     NO    CARBON    CONS.      HC      CO      NO2    FACT.    HC       CO     NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         68    .870   13.65    117    14.588    3765       18     454      10    .232     4.1     105     2.3     0    13.7
2 16 HG        26    .330   14.27    232    14.628    9208       18     420      48    .077     1.4      32     3.7     9    16.0
3 10 HG        22    .150   13.82    812    13.994   13699       23     297     264    .147     3.4      44    38.8    41    10.0
4 16 HG        23    .200   14.34    233    14.565    9208       16     255      49    .077     1.2      20     3.8     9    16.0
5 19 HG        38    .240   14.35    115    14.628    7938       21     263      21    .057     1.2      15     1.2     0    19.0
6 16 HG        29    .300   14.23    247    14.556    9208       16     383      52    .077     1.2      30     4.0     9    16.0
7  3 HG        30    .410   13.89   1894    14.332   21682       49    1253     951    .113     5.5     142   107.5    86     3.0
8 16 HG        26    .310   14.27    230    14.608    9208       18     395      48    .077     1.4      30     3.7     9    16.0
9 C.T.       1488   1.910   10.71     96    14.195    3901      433    1060       9    .143    61.9     152     1.3     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      4.4      31     9.0
1 IDLE         63    .870   13.65    117    14.588    3765       18     454      10    .232     4.1     105     2.3     0    13.7
2 16 HG        28    .250   14.23    226    14.510    9208       19     320      48    .077     1.5      25     3.7     9    16.0
3 10 HG        26    .110   13.82    848    13.958   13699       28     218     276    .147     4.1      32    40.6    41    10.0
4 16 HG        26    .260   14.30    235    14.588    9208       19     332      49    .077     1.4      26     3.8     9    16.0
5 19 HG        27    .320   14.36    188    14.709    7938       16     349      23    .057      .9      20     1.3     0    19.0
6 16 HG        26    .250   14.27    221    14.548    9208       18     320      46    .077     1.4      25     3.6     9    16.0
7  3 HG        33    .520   13.99   1849    14.546   21682       53    1566     915    .113     6.0     177   103.4    86     3.0
8 16 HG        27    .330   14.28    243    14.639    9208       18     419      51    .077     1.4      32     3.9     9    16.0
9 C.T.       1466   1.980   10.63     44    14.182    3901      433    1100       9    .143    61.9     157     1.2     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      4.5      32     8.9
1 IDLE         76   1.290   13.44    113    14.812    3765       21     637      10    .232     4.8     148     2.2     0    13.7
2 16 HG        47    .350   14.13    226    14.531    9208       32     448      48    .077     2.5      34     3.7     9    16.0
3 10 HG        35    .110   13.78    805    13.928   13699       37     219     263    .147     5.5      32    38.6    41    10.0
4 16 HG        38    .260   14.29    260    14.588    9208       24     332      54    .077     1.8      26     4.2     9    16.0
5 19 HG        43    .280   14.31    119    14.636    7938       25     307      21    .057     1.4      17     1.2     0    19.0
6 16 HG        34    .350   14.24    227    14.627    9208       23     445      47    .077     1.8      34     3.7     9    16.0
7  3 HG        37    .500   13.98   1934    14.520   21682       60    1508     959    .113     6.7     170   108.3    86     3.0
8 16 HG        31    .300   14.34    225    14.673    9208       21     380      47    .077     1.6      29     3.6     9    16.0
9 C.T.       1616   2.050   10.46     45    14.255    3901      478    1133       9    .143    68.3     162     1.2     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      5.1      35     9.0
1 IDLE         76   1.290   13.44    113    14.812    3765       21     637      10    .232     4.8     148     2.2     0    13.7
2 16 HG        33    .320   14.25    246    14.606    9208       22     408      51    .077     1.7      31     4.0     9    16.0
3 10 HG        27    .110   13.83    877    13.969   13699       29     218     286    .147     4.2      32    42.0    41    10.0
4 16 HG        30    .300   14.19    231    14.522    9208       21     384      49    .077     1.6      30     3.7     9    16.0
5 19 HG        31    .450   14.40    141    14.883    7938       18     485      25    .057     1.0      28     1.4     0    19.0
6 16 HG        29    .190   14.31    239    14.531    9208       20     243      50    .077     1.5      19     3.9     9    16.0
7  3 HG        35    .500   13.95   1921    14.488   21682       57    1512     954    .113     6.4     171   107.9    86     3.0
8 16 HG        30    .360   14.26    282    14.652    9208       20     457      53    .077     1.6      35     4.0     9    16.0
9 C.T.       1498   1.900   10.70    181    14.218    3901      444    1053      11    .143    63.5     151     1.6     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      4.7      35     9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------      4.4      32     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------      4.9      35     9.1
FOUR CYCLE COMPOSITE -
                                      HC- NDIR 0.35(     4.4) + 0.65(     4.9) =      4.728   GM/BHP HR
                                      CO- NDIR 0.35(    31.6) + 0.65(    35.1) =     33.841   GM/BHP HR
                                      NO2-NDIR 0.35(     8.9) + 0.65(     9.1) =      9.053   GM/BHP HR
                                                              CORRECTED NO2 =      9.515   GM/BHP HR
                                                                       BSFC =      1.095   LB/BHP HR
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MODE          CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
             HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO      NO2    FACT.  HC-FID     CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       1573    .870   13.65     65    14.677    3765       40     451       6    .232     9.4     105     1.3     0    13.7
2 16 HG       227    .330   14.27    185    14.623    9208       14     420      39    .077     1.1      32     3.0     9    16.0
3 10 HG       138    .150   13.82    770    13.984   13699       13     297     250    .147     2.0      44    36.8    41    10.0
4 16 HG       185    .200   14.34    190    14.558    9208       12     256      40    .077      .9      20     3.1     9    16.0
5 19 HG       298    .240   14.35     75    14.620    7938       16     263      14    .057      .9      15      .8     0    19.0
6 16 HG       192    .300   14.23    200    14.549    9208       12     384      42    .077      .9      30     3.2     9    16.0
7  3 HG       450    .410   13.89   1825    14.345   21682       68    1252     916    .113     7.7     141   103.5    86     3.0
8 16 HG       217    .310   14.27    213    14.602    9208       14     395      45    .077     1.1      30     3.4     9    16.0
9 C.T.      21888   1.910   10.71     50    14.809    3901      577    1016       4    .143    82.5     145      .6     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      5.8      30     8.4
1 IDLE       1573    .870   13.65     65    14.677    3765       40     451       6    .232     9.4     105     1.3     0    13.7
2 16 HG       333    .250   14.23    185    14.513    9208       21     320      39    .077     1.6      25     3.0     9    16.0
3 10 HG       166    .110   13.82    815    13.947   13699       16     218     266    .147     2.4      32    39.1    41    10.0
4 16 HG       217    .260   14.30    200    14.582    9208       14     332      42    .077     1.1      26     3.2     9    16.0
5 19 HG       281    .320   14.36     85    14.708    7938       15     349      15    .057      .9      20      .9     0    19.0
6 16 HG       185    .250   14.27    195    14.538    9208       12     320      41    .077      .9      25     3.2     9    16.0
7  3 HG       577    .520   13.99   1800    14.568   21682       86    1563     889    .113     9.7     177   100.5    86     3.0
8 16 HG       255    .330   14.28    212    14.636    9208       16     419      44    .077     1.2      32     3.4     9    16.0
9 C.T.      22556   1.980   10.63     50    14.866    3901      592    1050       4    .143    84.6     150      .6     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      6.0      32     8.4
1 IDLE       2017   1.290   13.44     65    14.932    3765       51     632       5    .232    11.8     147     1.3     0    13.7
2 16 HG       464    .350   14.13    190    14.526    9208       29     448      40    .077     2.3      35     3.1     9    16.0
3 10 HG       179    .110   13.78    800    13.908   13699       18     219     262    .147     2.6      32    38.5    41    10.0
4 16 HG       227    .260   14.29    225    14.573    9208       14     332      47    .077     1.1      26     3.6     9    16.0
5 19 HG       291    .280   14.31     80    14.619    7938       16     307      14    .057      .9      18      .8     0    19.0
6 16 HG       249    .350   14.24    185    14.615    9208       16     445      39    .077     1.2      34     3.0     9    16.0
7  3 HG       500    .500   13.98   1875    14.530   21682       75    1507     929    .113     8.4     170   105.0    86     3.0
8 16 HG       202    .300   14.34    200    14.660    9208       13     381      42    .077     1.0      29     3.2     9    16.0
9 C.T.      23430   2.050   10.46     35    14.853    3901      615    1088       3    .143    88.0     156      .4     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      6.3      35     8.6
1 IDLE       2017   1.290   13.44     65    14.932    3765       51     632       5    .232    11.8     147     1.3     0    13.7
2 16 HG       319    .320   14.25    195    14.602    9208       20     408      41    .077     1.5      31     3.1     9    16.0
3 10 HG       181    .110   13.83    815    13.958   13699       15     218     266    .147     2.2      32    39.0    41    10.0
4 16 HG       252    .300   14.19    190    14.515    9208       16     384      40    .077     1.2      30     3.1     9    16.0
5 19 HG       351    .450   14.40     75    14.885    7938       19     485      13    .057     1.1      28      .8     0    19.0
6 16 HG       180    .190   14.31    200    14.518    9208       11     243      42    .077      .9      19     3.2     9    16.0
7  3 HG       592    .500   13.95   1825    14.509   21682       81    1510     906    .113     9.2     171   102.3    86     3.0
8 16 HG       192    .360   14.26    212    14.639    9208       12     457      44    .077      .9      35     3.4     9    16.0
9 C.T.      22778   1.900   10.70     39    14.878    3901      597    1006       3    .143    85.4     144      .5     0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------------      6.2      34     8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------      5.9      31     8.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------      6.3      35     8.5
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(     5.9) + 0.65(     6.3) =      6.133   GM/BHP HR
                                      CO- NDIR 0.35(    31.2) + 0.65(    34.6) =     33.425   GM/BHP HR
                                      NO2-CL   0.35(     8.4) + 0.65(     8.5) =      8.480   GM/BHP HR
                                                              CORRECTED NO2 =      8.922   GM/BHP HR
                                                                       BSFC =      1.095   LB/BHP HR
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TABLE F-15 MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 6-0P  TEST 56  RUN-3   TIMING 6  ATDC        07-25-73      K =1.063     HUM = 98.7  GR/LB
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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR          MAN.
MODE        HC     CO     CO2      NO    CARBON   CONS.      HC     CO     NO2    FACT.   HC        CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE      29   .180   13.83    166    14.091    4444      11    128     19    .232    2.6       30    4.5     0    9.6
2 16 HG     25   .350   14.39    195    14.767    9980      17    454     42    .077    1.3       35    3.2     2   16.0
3 10 HG     24   .130   13.91    433    14.066   13699      25    256    140    .147    3.7       38   20.6    28   10.0
4 16 HG     25   .210   14.45    181    14.687    9980      17    274     39    .077    1.3       21    3.0     2   16.0
5 19 HG     43   .200   14.47    128    14.716    7938      25    218     23    .057    1.4       12    1.3     0   19.0
6 16 HG     24   .230   14.51    188    14.766    9980      17    298     40    .077    1.3       23    3.1     2   16.0
7  3 HG     24   .360   14.35    976    14.736   21869      38   1079    481    .113    4.3      122   54.3    70    3.0
8 16 HG     24   .260   14.48    189    14.736    9980      17    338     40    .077    1.3       26    3.1     2   16.0
9 C.T.      69   .480   14.31    123    14.859    5806      27    379     16    .143    3.9       54    2.3     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.7       29    7.6
1 IDLE      29   .180   13.83    166    14.091    4444      11    128     19    .232    2.6       30    4.5     0    9.6
2 16 HG     24   .180   14.46    191    14.666    9980      17    235     41    .077    1.3       18    3.2     2   16.0
3 10 HG     25   .110   13.96    430    14.097   13699      26    216    139    .147    3.9       32   20.4    28   10.0
4 16 HG     25   .230   14.41    207    14.667    9980      17    300     44    .077    1.3       23    3.4     2   16.0
5 19 HG     35   .320   14.47    138    14.828    7938      20    346     25    .057    1.2       20    1.4     0   19.0
6 16 HG     25   .270   14.44    211    14.737    9980      17    351     45    .077    1.3       27    3.5     2   16.0
7  3 HG     33   .340   14.33    978    14.706   21869      53   1021    483    .113    6.0      115   54.6    70    3.0
8 16 HG     25   .210   14.45    202    14.687    9980      17    274     43    .077    1.3       21    3.3     2   16.0
9 C.T.      77   .530   14.29    150    14.853    5806      33    418     19    .143    4.6       60    2.8     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.9       28    7.7
1 IDLE      35   .130   13.49    221    13.658    4444      14     95     27    .232    3.2       22    6.2     0    9.6
2 16 HG     27   .200   14.43    206    14.659    9980      19    261     44    .077    1.5       20    3.4     2   16.0
3 10 HG     25   .120   13.91    471    14.057   13699      26    236    152    .147    3.9       35   22.4    28   10.0
4 16 HG     26   .230   14.38    213    14.638    9980      18    301     46    .077    1.4       23    3.5     2   16.0
5 19 HG     37   .260   14.35    156    14.650    7938      22    285     28    .057    1.2       16    1.6     0   19.0
6 16 HG     27   .280   14.37    233    14.679    9980      19    365     50    .077    1.5       28    3.8     2   16.0
7  3 HG     28   .340   14.32   1056    14.690   21869      45   1022    522    .113    5.1      116   59.0    70    3.0
8 16 HG     27   .210   14.46    224    14.699    9980      19    274     48    .077    1.4       21    3.7     2   16.0
9 C.T.      74   .480   14.26    167    14.820    5806      31    380     22    .143    4.5       54    3.1     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.9       27    8.5
1 IDLE      35   .130   13.49    221    13.658    4444      14     95     27    .232    3.2       22    6.2     0    9.6
2 16 HG     26   .240   14.32    231    14.588    9980      18    315     50    .077    1.4       24    3.8     2   16.0
3 10 HG     26   .100   13.93    490    14.058   13699      27    197    159    .147    4.0       29   23.3    28   10.0
4 16 HG     25   .230   14.52    242    14.777    9980      17    298     52    .077    1.3       23    4.0     2   16.0
5 19 HG     48   .250   14.40    195    14.708    7938      28    273     35    .057    1.6       16    2.0     0   19.0
6 16 HG     26   .180   14.52    272    14.728    9980      18    234     58    .077    1.4       18    4.5     2   16.0
7  3 HG     26   .300   14.36   1103    14.688   21869      42    902    545    .113    4.7      102   61.6    70    3.0
8 16 HG     25   .230   14.48    272    14.737    9980      17    299     58    .077    1.3       23    4.5     2   16.0
9 C.T.      71   .480   14.32    212    14.877    5806      30    378     27    .143    4.3       54    3.9     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.9       25    9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    1.8       28    7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    1.9       26    8.8
FOUR CYCLE COMPOSITE -               HC- NDIR 0.35(     1.8) + 0.65(     1.9) =     1.839   GM/BHP HR
                                     CO- NDIR 0.35(    28.1) + 0.65(    25.7) =    26.560   GM/BHP HR
                                     NO2-NDIR 0.35(     7.7) + 0.65(     8.8) =     8.384   GM/BHP HR
                                                            CORRECTED NO2 =     8.913   GM/BHP HR
                                                                     BSFC =     1.726   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR          MAN.
MODE       HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC     CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE     269   .180   13.83    120    14.036    4444       9    128     14    .232    2.2       30    3.3     0    9.6
2 16 HG    128   .350   14.39    135    14.753    9980       8    454     29    .077     .6       35    2.2     2   16.0
3 10 HG     88   .130   13.91    370    14.049   13699       9    256    120    .147    1.3       38   17.6    28   10.0
4 16 HG    107   .210   14.45    125    14.671    9980       7    274     27    .077     .5       21    2.1     2   16.0
5 19 HG    658   .200   14.47     60    14.736    7938      35    218     11    .057    2.0       12     .6     0   19.0
6 16 HG     89   .230   14.51    130    14.799    9980       6    299     28    .077     .4       23    2.1     2   16.0
7  3 HG    152   .360   14.35    875    14.725   21869      23   1080    431    .113    2.6      122   48.7    70    3.0
8 16 HG    103   .260   14.46    128    14.720    9980       7    338     27    .077     .5       26    2.1     2   16.0
9 C.T.    1307   .480   14.31     55    14.921    5806      51    377      7    .143    7.3       54    1.0     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.4       29    6.3
1 IDLE     269   .180   13.83    105    14.036    4444       9    128     12    .232    2.2       30    2.8     0    9.6
2 16 HG    237   .180   14.46    110    14.669    9980      15    235     24    .077    1.2       18    1.8     2   16.0
3 10 HG     81   .110   13.96    360    14.070   13699       8    216    116    .147    1.2       32   17.1    28   10.0
4 16 HG     84   .230   14.41    125    14.699    9980       6    301     27    .077     .4       23    2.1     2   16.0
5 19 HG    462   .320   14.47     60    14.836    7938      25    346     11    .057    1.4       20     .6     0   19.0
6 16 HG     72   .270   14.44    125    14.717    9980       5    351     27    .077     .4       27    2.1     2   16.0
7  3 HG    152   .340   14.33    860    14.685   21869      23   1023    425    .113    2.6      116   48.0    70    3.0
8 16 HG    119   .210   14.45    115    14.671    9980       7    274     25    .077     .6       21    1.9     2   16.0
9 C.T.    1137   .530   14.29     55    14.884    5806      44    418      7    .143    6.3       60    1.0     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.3       28    6.2
1 IDLE     334   .130   13.49    110    13.653    4444      12     95     13    .232    2.8       22    3.1     0    9.6
2 16 HG    160   .200   14.43    115    14.646    9980      10    261     25    .077     .8       20    1.9     2   16.0
3 10 HG     81   .120   13.91    365    14.038   13699       8    237    118    .147    1.2       35   17.4    28   10.0
4 16 HG     82   .230   14.38    115    14.618    9980       5    301     25    .077     .4       23    1.9     2   16.0
5 19 HG    781   .260   14.35     60    14.688    7938      42    284     11    .057    2.4       16     .6     0   19.0
6 16 HG     92   .280   14.37    125    14.659    9980       6    366     27    .077     .5       28    2.1     2   16.0
7  3 HG    124   .340   14.32    885    14.672   21869      19   1028    438    .113    2.1      116   49.5    70    3.0
8 16 HG     92   .210   14.46    125    14.679    9980       6    274     27    .077     .5       21    2.1     2   16.0
9 C.T.    1278   .480   14.26     59    14.868    5806      50    374      8    .143    7.1       54    1.1     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.4       27    6.3
1 IDLE     334   .130   13.49    110    13.653    4444      12     95     13    .232    2.8       22    3.1     0    9.6
2 16 HG     82   .240   14.32    115    14.568    9980       5    315     25    .077     .4       24    1.9     2   16.0
3 10 HG     60   .100   13.93    360    14.036   13699       6    197    117    .147     .9       29   17.1    28   10.0
4 16 HG     67   .230   14.52    120    14.757    9980       4    298     26    .077     .3       23    2.0     2   16.0
5 19 HG    511   .250   14.40     60    14.701    7938      28    273     11    .057    1.6       16     .6     0   19.0
6 16 HG     75   .180   14.52    135    14.707    9980       5    234     29    .077     .4       18    2.2     2   16.0
7  3 HG    107   .300   14.36    925    14.671   21869      16    903    458    .113    1.8      102   51.7    70    3.0
8 16 HG     75   .230   14.48    120    14.717    9980       5    299     26    .077     .4       23    2.0     2   16.0
9 C.T.    1307   .480   14.32     57    14.931    5806      51    377      7    .143    7.3       54    1.1     0   19.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.3       25    6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    1.3       28    6.3
AVERAGF SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    1.3       26    6.4
FOUR CYCLE COMPOSITE -               HC- FID  0.35(     1.3) + 0.65(     1.3) =     1.335   GM/BHP HR
                                     CO- NDIR 0.35(    28.1) + 0.65(    25.7) =    26.568   GM/BHP HR
                                     NO2-CL   0.35(     6.3) + 0.65(     6.4) =     6.362   GM/BHP HR
                                                            CORRECTED NO2 =     6.763   GM/BHP HR
                                                                     BSFC =     1.726   LB/BHP HR
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                                TABLE F-16 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-DP  TEST-57  RUN-8   CARBURETOR JETS 58    08-06-73      K =1.056      HUM = 95.6  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR                MAN.
MODE            HC      CO    CO2     NO    CARBON   CONS.       HC      CO     NO2   FACT.    HC       CO     NO2     HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          89   1.060  12.99     98   14.146    3039        21     460       7   .232     4.8     107     1.6      0     19.2
2 16 MG         31    .160  13.25    168   13.443    8573        21     206      36   .077     1.6      16     2.7     10     16.0
3 10 MG         25    .160  12.58    585   12.767   12792        27     324     195   .147     4.0      48    28.6     43     10.0
4 16 MG         26    .120  13.32    195   13.468    8573        18     154      41   .077     1.4      12     3.2     10     16.0
5 19 MG         26    .160  13.49    110   13.678    7258        15     171      19   .057      .8      10     1.1      0     19.0
6 16 MG         23    .120  13.33    199   13.475    8573        16     154      42   .077     1.2      12     3.2     10     16.0
7  3 MG         27    .260  13.30   1637   13.589   20099        43     777     804   .113     4.9      88    90.8     87      3.0
8 16 MG         24    .100  13.47    199   13.596    8573        16     127      42   .077     1.3      10     3.2     10     16.0
9 C.T.        2093   2.120   9.50     94   13.880    3311       539    1022       7   .143    77.1     146     1.1      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      5.0      23     7.0
1 IDLE          89   1.060  12.99     98   14.146    3039        21     460       7   .232     4.8     107     1.6      0     19.2
2 16 MG         27    .210  13.60    207   13.839    8573        18     263      43   .077     1.4      20     3.3     10     16.0
3 10 MG         28    .170  12.93    669   13.130   12792        29     335     216   .147     4.3      49    31.8     43     10.0
4 16 MG         26    .160  13.53    205   13.718    8573        18     202      43   .077     1.4      16     3.3     10     16.0
5 19 MG         23    .150  13.78    135   13.955    7258        13     158      23   .057      .7       9     1.3      0     19.0
6 16 MG         22    .140  13.62    230   13.784    8573        15     176      47   .077     1.1      14     3.7     10     16.0
7  3 MG         32    .340  13.63   1852   14.005   20099        50     985     882   .113     5.6     111    99.7     87      3.0
8 16 MG         24    .110  13.58    223   13.716    8573        16     139      46   .077     1.2      11     3.6     10     16.0
9 C.T.        2104   1.900   9.60    128   13.772    3311       546     923      10   .143    78.1     132     1.5      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      5.1      24     7.8
1 IDLE         185   1.520  12.83    145   14.550    3039        42     641      10   .232     9.7     149     2.3      0     19.2
2 16 MG         34    .180  13.68    235   13.897    8573        23     224      48   .077     1.7      17     3.7     10     16.0
3 10 MG         28    .140  12.90    753   13.070   12792        30     277     245   .147     4.4      41    36.0     43     10.0
4 16 MG         26    .160  13.59    261   13.778    8573        17     201      54   .077     1.3      15     4.2     10     16.0
5 19 MG         40    .160  13.75    185   13.953    7258        22     168      32   .057     1.3      10     1.8      0     19.0
6 16 MG         28    .130  13.59    286   13.750    8573        19     164      59   .077     1.5      13     4.6     10     16.0
7  3 MG         32    .260  13.48   1979   13.775   20099        50     766     956   .113     5.7      87   108.0     87      3.0
8 16 MG         27    .110  13.59    293   13.729    8573        18     139      61   .077     1.4      11     4.7     10     16.0
9 C.T.        2069   1.760   9.73    203   13.725    3311       539     858      16   .143    77.1     123     2.3      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      5.4      24     8.7
1 IDLE         185   1.520  12.83    145   14.550    3039        42     641      10   .232     9.7     149     2.3      0     19.2
2 16 MG         32    .170  13.63    236   13.835    8573        21     213      49   .077     1.6      16     3.7     10     16.0
3 10 MG         26    .230  13.02    680   13.278   12792        27     448     217   .147     4.0      66    32.0     43     10.0
4 16 MG         24    .240  13.61    230   13.876    8573        16     300      47   .077     1.2      23     3.6     10     16.0
5 19 MG         46    .160  13.57    135   13.780    7258        26     170      24   .057     1.5      10     1.3      0     19.0
6 16 MG         27    .170  13.53    231   13.729    8573        18     214      48   .077     1.4      17     3.7     10     16.0
7  3 MG         33    .330  13.51   2056   13.876   20099        52     965     988   .113     5.8     109   111.7     87      3.0
8 16 MG         24    .120  13.61    242   13.756    8573        16     151      50   .077     1.2      12     3.9     10     16.0
9 C.T.        1958   1.640   9.95    170   13.705    3311       511     800      14   .143    73.1     114     1.9      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      5.2      27     8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------      5.1      24     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------      5.3      25     8.6
FOUR CYCLE COMPOSITE -
                                         HC- NDIR 0.35(      5.1) + 0.65(      5.3) =     5.203   GM/BHP HR
                                         CO- NDIR 0.35(     23.7) + 0.65(     25.4) =    24.794   GM/BHP HR
                                         NO2-NDIR 0.35(      7.4) + 0.65(      8.6) =     8.172   GM/BHP HR
                                                            CORRECTED NO2 =     8.633   GM/BHP HR
                                                                     BSFC =      .957   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR                MAN.
MODE          HC-FID    CO    CO2   NO-CL   CARBON   CONS.       HC      CO     NO2   FACT.  HC-FID     CO   NO2-CL    HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        3503   1.060  12.99     40   14.400    3039        74     452       3   .232    17.2     105      .7      0     19.2
2 16 MG        134    .160  13.25    160   13.423    8573         9     206      34   .077      .7      16     2.6     10     16.0
3 10 MG        102    .160  12.58    670   12.750   12792        10     324     223   .147     1.5      48    32.8     43     10.0
4 16 MG         54    .120  13.32    160   13.445    8573         3     155      34   .077      .3      12     2.6     10     16.0
5 19 MG        141    .160  13.49     65   13.664    7258         7     172      11   .057      .4      10      .7      0     19.0
6 16 MG         53    .120  13.33    195   13.455    8573         3     154      41   .077      .3      12     3.2     10     16.0
7  3 MG        478    .260  13.30   1650   13.608   20099        71     776     809   .113     8.0      88    91.4     87      3.0
8 16 MG         56    .100  13.47    190   13.576    8573         4     128      40   .077      .3      10     3.1     10     16.0
9 C.T.       29681   2.120   9.50     20   14.588    3311       674     972       2   .143    96.3     139      .2      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      6.5      23     7.1
1 IDLE        3503   1.060  12.99     40   14.400    3039        74     452       3   .232    17.2     105      .7      0     19.2
2 16 MG        150    .210  13.60    150   13.825    8573         9     263      31   .077      .7      20     2.4     10     16.0
3 10 MG        102    .170  12.93    700   13.110   12792        10     336     227   .147     1.5      49    33.3     43     10.0
4 16 MG         66    .160  13.53    205   13.697    8573         4     202      43   .077      .3      16     3.3     10     16.0
5 19 MG        247    .150  13.78     65   13.955    7258        13     158      11   .057      .7       9      .6      0     19.0
6 16 MG         56    .140  13.62    185   13.766    8573         4     176      38   .077      .3      14     2.9     10     16.0
7  3 MG        417    .340  13.63   1875   14.012   20099        60     985     893   .113     6.8     111   100.9     87      3.0
8 16 MG         56    .110  13.58    185   13.696    8573         4     139      38   .077      .3      11     3.0     10     16.0
9 C.T.       29208   1.900   9.60     20   14.421    3311       671     881       2   .143    95.9     126      .2      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      6.4      24     7.6
1 IDLE        5182   1.520  12.83     40   14.868    3039       106     628       3   .232    24.6     146      .6      0     19.2
2 16 MG        159    .180  13.68    180   13.876    8573        10     225      37   .077      .8      17     2.8     10     16.0
3 10 MG        103    .140  12.90    685   13.050   12792        10     277     223   .147     1.5      41    32.8     43     10.0
4 16 MG         67    .160  13.59    170   13.757    8573         4     201      35   .077      .3      16     2.7     10     16.0
5 19 MG        257    .160  13.75     65   13.936    7258        13     168      11   .057      .8      10      .6      0     19.0
6 16 MG         56    .130  13.59    180   13.726    8573         4     164      37   .077      .3      13     2.9     10     16.0
7  3 MG        401    .260  13.48   1962   13.780   20099        59     766     950   .113     6.6      87   107.3     87      3.0
8 16 MG         63    .110  13.59    180   13.706    8573         4     139      37   .077      .3      11     2.9     10     16.0
9 C.T.       27878   1.760   9.73     20   14.278    3311       646     824       2   .143    92.4     118      .2      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      6.6      24     7.9
1 IDLE        5182   1.520  12.83     40   14.868    3039       106     628       3   .232    24.6     146      .6      0     19.2
2 16 MG        178    .170  13.63    160   13.818    8573        11     213      33   .077      .9      16     2.5     10     16.0
3 10 MG         91    .230  13.02    680   13.259   12792         9     448     199   .147     1.3      66    29.3     43     10.0
4 16 MG         78    .240  13.61    160   13.858    8573         5     300      33   .077      .4      23     2.5     10     16.0
5 19 MG        264    .160  13.57     65   13.756    7258        14     171      11   .057      .8      10      .6      0     19.0
6 16 MG         60    .170  13.53    170   13.706    8573         4     215      35   .077      .3      17     2.7     10     16.0
7  3 MG        433    .330  13.51   1962   13.883   20099        63     965     943   .113     7.1     109   106.5     87      3.0
8 16 MG         53    .120  13.61    170   13.735    8573         3     151      35   .077      .3      12     2.7     10     16.0
9 C.T.       29673   1.640   9.95     20   14.557    3311       675     753       2   .143    96.5     108      .2      0     22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      6.8      26     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------      6.4      23     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------      6.7      25     7.8
FOUR CYCLE COMPOSITE -
                                         HC- FID  0.35(      6.4) + 0.65(      6.7) =     6.622   GM/BHP HR
                                         CO- NDIR 0.35(     23.3) + 0.65(     24.9) =    24.347   GM/BHP HR
                                         NO2-CL   0.35(      7.4) + 0.65(      7.8) =     7.640   GM/BHP HR
                                                            CORRECTED NO2 =     8.071   GM/BHP HR
                                                                     BSFC =      .957   LB/BHP HR
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                              TABLE F-17 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP  TEST 57  RUN-5   CARBURETOR JETS 59    07-26-73        K =1.083       HUM =109.2  GR/LB
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            CONCENTRATION AS MEASURED   TOTAL    FUEL    CALCULATED GM/HR     WT.     WEIGHTED GM/HR             MAN.
MODE         HC      CO    CO2     NO   CARBON   CONS.     HC     CO    NO2  FACT.      HC     CO     NO2   HP   VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE      139    .660  13.47    122   14.280    3674     39    343     10   .232     9.0     80     2.4    0   13.9
2 16 HG      37    .230  14.07    272   14.340    8981     25    291     57   .077     1.9     22     4.4   11   16.0
3 10 HG      30    .160  13.35    877   13.542   13381     32    319    288   .147     4.7     47    42.3   45   10.0
4 16 HG      30    .170  14.11    260   14.312    8981     20    215     54   .077     1.6     17     4.2   11   16.0
5 19 HG      40    .160  14.10    127   14.303    7348     22    166     22   .057     1.3      9     1.2    0   19.0
6 16 HG      29    .160  14.16    263   14.351    8981     20    202     55   .077     1.5     16     4.2   11   16.0
7  3 HG      38    .480  13.85   2307   14.371   21319     61   1438   1136   .113     6.9    163   128.4   89    3.0
8 16 HG      28    .170  14.25    268   14.450    8981     19    213     55   .077     1.4     16     4.3   11   16.0
9 C.T.     1772   1.520  10.47     88   13.904    3810    524    841      8   .143    75.0    120     1.1    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.1     24     9.5
1 IDLE      139    .660  13.47    122   14.280    3674     39    343     10   .232     9.0     80     2.4    0   13.9
2 16 HG      40    .180  14.09    239   14.313    8981     27    228     49   .077     2.1     18     3.8   11   16.0
3 10 HG      33    .160  13.50    963   13.696   13381     35    316    312   .147     5.1     46    45.9   45   10.0
4 16 HG      33    .190  14.28    236   14.506    8981     22    238     49   .077     1.7     18     3.7   11   16.0
5 19 HG      60    .140  14.05    111   14.255    7348     33    146     19   .057     1.9      8     1.1    0   19.0
6 16 HG      32    .200  14.19    270   14.425    8981     22    252     56   .077     1.7     19     4.3   11   16.0
7  3 HG      41    .440  13.92   2295   14.404   21319     66   1315   1128   .113     7.4    149   127.4   89    3.0
8 16 HG      30    .200  14.26    259   14.492    8981     20    250     53   .077     1.5     19     4.1   11   16.0
9 C.T.     1709   1.590  10.55     89   13.980    3810    502    875      8   .143    71.7    125     1.2    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.1     24     9.6
1 IDLE      209    .780  13.49    103   14.496    3674     57    399      9   .232    13.3     93     2.0    0   13.9
2 16 HG      39    .180  14.15    232   14.372    8981     26    227     48   .077     2.0     17     3.7   11   16.0
3 10 HG      33    .140  13.47    915   13.646   13381     35    277    298   .147     5.1     41    43.8   45   10.0
4 16 HG      33    .230  14.16    241   14.426    8981     22    289     50   .077     1.7     22     3.8   11   16.0
5 19 HG      40    .140  14.10    104   14.283    7348     22    145     18   .057     1.3      8     1.0    0   19.0
6 16 HG      30    .170  14.25    260   14.452    8981     20    213     54   .077     1.6     16     4.1   11   16.0
7  3 HG      40    .400  13.97   2264   14.413   21319     64   1195   1112   .113     7.2    135   125.6   89    3.0
8 16 HG      30    .140  14.20    258   14.372    8981     20    177     54   .077     1.6     14     4.1   11   16.0
9 C.T.     1753   1.520  10.54     87   13.953    3810    517    838      8   .143    73.9    120     1.1    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.3     23     9.4
1 IDLE      209    .780  13.49    103   14.496    3674     57    399      9   .232    13.3     93     2.0    0   13.9
2 16 HG      39    .180  14.16    242   14.382    8981     26    227     50   .077     2.0     17     3.9   11   16.0
3 10 HG      31    .150  13.50    812   13.683   13381     33    296    264   .147     4.8     44    38.8   45   10.0
4 16 HG      32    .240  14.23    266   14.505    8981     21    300     55   .077     1.6     23     4.2   11   16.0
5 19 HG      38    .130  14.23    115   14.401    7348     21    134     19   .057     1.2      8     1.1    0   19.0
6 16 HG      31    .160  14.20    265   14.393    8981     21    202     55   .077     1.6     16     4.2   11   16.0
7  3 HG      41    .440  13.97   2397   14.454   21319     65   1311   1174   .113     7.4    148   132.6   89    3.0
8 16 HG      31    .160  14.28    270   14.473    8981     21    201     56   .077     1.6     15     4.3   11   16.0
9 C.T.     1740   1.510  10.59     88   13.979    3810    512    831      8   .143    73.2    119     1.1    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.3     24     9.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     5.1     24     9.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     5.3     23     9.4
FOUR CYCLE COMPOSITE -                        HC- NDIR 0.35(      5.1) + 0.65(      5.3) =     5.226   GM/BHP HR
                                              CO- NDIR 0.35(     24.1) + 0.65(     23.5) =    23.675   GM/BHP HR
                                              NO2-NDIR 0.35(      9.6) + 0.65(      9.4) =     9.480   GM/BHP HR
                                                                        CORRECTED NO2 =    10.271   GM/BHP HR
                                                                                 BSFC =      .477   LB/BHP HR
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            CONCENTRATION AS MEASURED   TOTAL    FUEL    CALCULATED GM/HR     WT.     WEIGHTED GM/HR             MAN.
MODE     HC-FID      CO    CO2  NO-CL   CARBON   CONS.     HC     CO    NO2  FACT.  HC-FID     CO  NO2-CL   HP   VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE     3166    .660  13.47     65   14.447    3674     81    339      5   .232    18.7     79     1.3    0   13.9
2 16 HG     248    .230  14.07    245   14.325    8981     16    291     51   .077     1.2     22     3.9   11   16.0
3 10 HG     179    .160  13.35    825   13.528   13381     18    320    271   .147     2.6     47    39.8   45   10.0
4 16 HG     138    .170  14.11    220   14.294    8981      9    216     46   .077      .7     17     3.5   11   16.0
5 19 HG     460    .160  14.10    100   14.306    7348     24    166     17   .057     1.3      9     1.0    0   19.0
6 16 HG     126    .160  14.16    230   14.333    8981      8    203     48   .077      .6     16     3.7   11   16.0
7  3 HG     644    .480  13.85   2225   14.394   21319     95   1436   1094   .113    10.8    162   123.6   89    3.0
8 16 HG     170    .170  14.25    240   14.437    8981     11    219     50   .077      .8     16     3.8   11   16.0
9 C.T.    25329   1.520  10.47     35   14.523    3810    664    806      3   .143    95.0    115      .4    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     6.5     24     9.0
1 IDLE     3166    .660  13.47     65   14.447    3674     81    339      5   .232    18.7     79     1.3    0   13.9
2 16 HG     350    .180  14.09    210   14.305    8981     22    228     44   .077     1.7     18     3.4   11   16.0
3 10 HG     260    .160  13.50    920   13.686   13381     25    316    299   .147     3.7     46    43.9   45   10.0
4 16 HG     205    .190  14.28    210   14.491    8981     13    238     43   .077     1.0     18     3.3   11   16.0
5 19 HG     665    .140  14.05     80   14.257    7348     34    146     14   .057     2.0      8      .8    0   19.0
6 16 HG     188    .200  14.19    245   14.409    8981     12    252     51   .077      .9     19     3.9   11   16.0
7  3 HG     651    .440  13.92   2275   14.425   21319     96   1314   1116   .113    10.9    148   126.1   89    3.0
8 16 HG     195    .200  14.26    240   14.480    8981     12    251     49   .077      .9     19     3.8   11   16.0
9 C.T.    30588   1.590  10.55     35   15.199    3810    767    805      3   .143   109.6    115      .4    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     7.4     23     9.2
1 IDLE     4019    .780  13.49     65   14.672    3674    101    395      5   .232    23.3     92     1.3    0   13.9
2 16 HG     340    .180  14.15    210   14.364    8981     21    227     44   .077     1.6     18     3.4   11   16.0
3 10 HG     256    .140  13.47    890   13.636   13381     25    278    290   .147     3.7     41    42.6   45   10.0
4 16 HG     198    .230  14.16    225   14.410    8981     12    290     47   .077     1.0     22     3.6   11   16.0
5 19 HG     439    .140  14.10     85   14.284    7348     23    145     15   .057     1.3      8      .8    0   19.0
6 16 HG     168    .170  14.25    230   14.437    8981     10    219     48   .077      .8     16     3.7   11   16.0
7  3 HG     662    .400  13.97   2237   14.436   21319     98   1193   1097   .113    11.0    135   123.9   89    3.0
8 16 HG     170    .140  14.20    235   14.357    8981     11    177     49   .077      .8     14     3.8   11   16.0
9 C.T.    31679   1.520  10.54     35   15.228    3810    793    768      3   .143   113.3    110      .4    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     7.8     23     9.1
1 IDLE     4019    .780  13.49     65   14.672    3674    101    395      5   .232    23.3     92     1.3    0   13.9
2 16 HG     355    .180  14.16    215   14.375    8981     22    227     45   .077     1.7     17     3.4   11   16.0
3 10 HG     243    .150  13.50    800   13.674   13381     24    297    260   .147     3.5     44    38.2   45   10.0
4 16 HG     198    .240  14.23    250   14.490    8981     12    300     51   .077      .9     23     4.0   11   16.0
5 19 HG     403    .130  14.23     95   14.400    7348     21    134     16   .057     1.2      8      .9    0   19.0
6 16 HG     173    .160  14.20    240   14.377    8981     11    202     50   .077      .8     16     3.8   11   16.0
7  3 HG     702    .440  13.97   2325   14.480   21319    103   1309   1136   .113    11.7    148   128.4   89    3.0
8 16 HG     163    .160  14.28    240   14.456    8981     10    201     50   .077      .8     15     3.8   11   16.0
9 C.T.    25352   1.510  10.59     35   14.635    3810    660    794      3   .143    94.4    114      .4    0   21.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     6.8     24     9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     7.0     24     9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     7.3     23     9.1
FOUR CYCLE COMPOSITE -                        HC- FID  0.35(      7.0) + 0.65(      7.3) =     7.181   GM/BHP HR
                                              CO- NDIR 0.35(     23.6) + 0.65(     23.0) =    23.238   GM/BHP HR
                                              NO2-CL   0.35(      9.1) + 0.65(      9.1) =     9.098   GM/BHP HR
                                                                        CORRECTED NO2 =     9.856   GM/BHP HR
                                                                                 BSFC =      .477   LB/BHP HR
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                              TABLE F-18 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-57  RUN 2   CARBURETOR JETS 61    07-26-73     K =1.099     HUM =119.6  GR/LB
-----------------------------------------------------------------------------------------------------------------
MODE           CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR            MAN.
                 HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.    HC      CO    NO2    HP   VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE           89   1.410   13.14     93    14.696    3583      24     697       8    .232     5.5    162    1.8     0   19.6
2 16 MG          43    .770   14.53    338    15.346    9616      29     975      70    .077     2.2     75    5.4    18   16.0
3 10 MG          35    .240   14.37   1467    14.698   14339      37     474     477    .147     5.4     70   70.1    50   10.0
4 16 MG          39    .860   14.58    371    15.482    9616      26    1079      77    .077     2.0     83    5.9    18   16.0
5 19 MG          31    .630   14.74    136    15.403    7212      16     596      21    .057      .9     34    1.2     0   19.0
6 16 MG          38    .870   14.52    375    15.431    9616      26    1095      78    .077     2.0     84    6.0    18   16.0
7  3 MG          50   1.080   13.97   2059    15.104   22095      79    3184     995    .113     8.9    360  112.5    93    3.0
8 16 MG          39   1.030   14.52    336    15.592    9616      26    1283      69    .077     2.0     99    5.3    18   16.0
9 C.T.         2221   2.540    9.66     77    14.599    3720     611    1307       7    .143    87.4    187     .9     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     5.0     49    9.0
1 IDLE           89   1.410   13.14     93    14.696    3583      24     697       8    .232     5.5    162    1.8     0   19.6
2 16 MG          41    .950   14.35    349    15.344    9616      28    1203      73    .077     2.1     93    5.6    18   16.0
3 10 MG          33    .400   14.03   1409    14.466   14339      35     801     464    .147     5.2    118   68.1    50   10.0
4 16 MG          36    .970   14.33    360    15.339    9616      24    1228      73    .077     1.9     95    5.6    18   16.0
5 19 MG          29    .690   14.36    140    15.081    7212      15     667      22    .057      .9     38    1.3     0   19.0
6 16 MG          36    .880   14.22    377    15.139    9616      25    1129      80    .077     1.9     87    6.1    18   16.0
7  3 MG          49   1.310   13.78   2090    15.143   22095      77    3852    1010    .113     8.7    435  114.1    93    3.0
8 16 MG          42   1.060   14.28    319    15.385    9616      28    1338      66    .077     2.2    103    5.1    18   16.0
9 C.T.         2221   2.540    9.59     76    14.529    3720     614    1314       6    .143    87.8    188     .9     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     5.0     56    8.9
1 IDLE          103   2.270   12.95     94    15.331    3583      26    1072       7    .232     6.0    249    1.7     0   19.6
2 16 MG          39    .950   14.29    339    15.282    9616      27    1207      71    .077     2.0     93    5.5    18   16.0
3 10 MG          30    .320   14.11   1464    14.462   14339      32     641     482    .147     4.7     94   70.8    50   10.0
4 16 MG          34    .880   14.32    319    15.237    9616      23    1122      67    .077     1.8     86    5.1    18   16.0
5 19 MG          31    .420   14.54    126    14.993    7212      16     408      20    .057      .9     23    1.1     0   19.0
6 16 MG          36    .940   14.32    366    15.299    9616      24    1193      76    .077     1.9     92    5.9    18   16.0
7  3 MG          47   1.130   13.83   2179    15.011   22095      75    3352    1062    .113     8.5    379  120.1    93    3.0
8 16 MG          37    .980   14.31    339    15.330    9616      25    1242      71    .077     1.9     96    5.4    18   16.0
9 C.T.         2270   2.470    9.54     79    14.462    3720     631    1283       7    .143    90.2    184    1.0     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     5.1     55    9.3
1 IDLE          103   2.230   12.95     94    15.291    3583      26    1056       7    .232     6.0    245    1.7     0   19.6
2 16 MG          42    .930   14.29    320    15.265    9616      29    1183      67    .077     2.2     91    5.2    18   16.0
3 10 MG          26    .250   14.15   1408    14.428   14339      28     502     464    .147     4.1     74   68.3    50   10.0
4 16 MG          35    .770   14.33    316    15.138    9616      24     988      67    .077     1.8     76    5.1    18   16.0
5 19 MG          25    .450   14.60    125    15.077    7212      13     435      20    .057      .7     25    1.1     0   19.0
6 16 MG          35    .870   14.36    325    15.268    9616      24    1107      68    .077     1.8     85    5.2    18   16.0
7  3 MG          44    .980   13.97   2233    14.998   22095      70    2910    1090    .113     7.9    329  123.1    93    3.0
8 16 MG          36    .970   14.36    313    15.369    9616      24    1226      65    .077     1.9     94    5.0    18   16.0
9 C.T.         2215   2.470    9.51     81    14.372    3720     619    1291       7    .143    88.5    185    1.0     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.9     52    9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     5.0     53    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     5.0     54    9.3
FOUR CYCLE COMPOSITE -
                                      HC- NDIR 0.35(    5.0) + 0.65(    5.0) =    4.991   GM/BHP HR
                                      CO- NDIR 0.35(   53.0) + 0.65(   53.6) =   53.365   GM/BHP HR
                                      NO2-NDIR 0.35(    9.0) + 0.65(    9.3) =    9.159   GM/BHP HR
                                                           CORRECTED NO2 =   10.062   GM/BHP HR
                                                                    BSFC =     .882   LB/BHP HR


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MODE           CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR            MAN.
               HC-FID    CO     CO2  NO-CL    CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL  HP   VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         2950   1.410   13.14     55    14.845    3583      71     687       4    .232    16.5    159    1.0     0   19.6
2 16 MG         856    .770   14.53    350    15.386    9616      54     972      73    .077     4.1     75    5.6    18   16.0
3 10 MG         568    .240   14.37   1412    14.667   14339      55     474     458    .147     8.2     70   67.3    50   10.0
4 16 MG         829    .860   14.58    337    15.523    9616      51    1076      69    .077     4.0     83    5.3    18   16.0
5 19 MG         571    .630   14.74    113    15.427    7212      27     595      18    .057     1.5     34    1.0     0   19.0
6 16 MG         857    .870   14.52    350    15.476    9616      53    1092      72    .077     4.1     84    5.6    18   16.0
7  3 MG        1111   1.080   13.97   2012    15.161   22095     162    3172     971    .113    18.3    358  109.8    93    3.0
8 16 MG         801   1.030   14.52    312    15.630    9616      49    1280      64    .077     3.8     99    4.9    18   16.0
9 C.T.        28044   2.540    9.66     20    15.004    3720     695    1272       2    .143    99.4    182     .2     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.9     49    8.6
1 IDLE         2950   1.410   13.14     55    14.845    3583      71     687       4    .232    16.5    159    1.0     0   19.6
2 16 MG         913    .950   14.35    310    15.391    9616      57    1199      64    .077     4.4     92    5.0    18   16.0
3 10 MG         538    .400   14.03   1404    14.484   14339      53     800     461    .147     7.8    118   67.8    50   10.0
4 16 MG         799    .970   14.33    320    15.380    9616      50    1225      66    .077     3.8     94    5.1    18   16.0
5 19 MG         456    .690   14.36    105    15.096    7212      22     666      17    .057     1.2     38     .9     0   19.0
6 16 MG         741    .880   14.22    330    15.174    9616      47    1126      69    .077     3.6     87    5.3    18   16.0
7  3 MG        1083   1.310   13.78   2050    15.198   22095     157    3838     987    .113    17.7    434  111.6    93    3.0
8 16 MG         771   1.060   14.28    312    15.417    9616      48    1336      65    .077     3.7    103    5.0    18   16.0
9 C.T.        26026   2.540    9.59     25    14.733    3720     657    1296       2    .143    94.0    185     .3     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.6     56    8.7
1 IDLE         3519   2.270   12.95     55    15.571    3583      81    1055       4    .232    18.8    245    1.0     0   19.6
2 16 MG         941    .950   14.29    305    15.334    9616      59    1203      63    .077     4.5     93    4.9    18   16.0
3 10 MG         538    .320   14.11   1425    14.484   14339      53     640     468    .147     7.8     94   68.8    50   10.0
4 16 MG         684    .880   14.32    287    15.268    9616      43    1120      60    .077     3.3     86    4.6    18   16.0
5 19 MG         342    .420   14.54    100    14.994    7212      16     408      16    .057      .9     23     .9     0   19.0
6 16 MG         742    .940   14.32    337    15.334    9616      47    1191      70    .077     3.6     92    5.4    18   16.0
7  3 MG         996   1.130   13.83   2187    15.060   22095     146    3341    1063    .113    16.5    378  120.1    93    3.0
8 16 MG         970    .980   14.31    300    15.387    9616      61    1237      62    .077     4.7     95    4.8    18   16.0
9 C.T.        26666   2.470    9.54     50    14.677    3720     676    1265       4    .143    96.7    181     .6     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.7     55    9.1
1 IDLE         3512   2.230   12.95     55    15.531    3583      81    1039       4    .232    18.8    241    1.0     0   19.6
2 16 MG         970    .930   14.29    280    15.317    9616      61    1179      58    .077     4.7     91    4.5    18   16.0
3 10 MG         567    .250   14.15   1375    14.457   14339      56     501     453    .147     8.3     74   66.5    50   10.0
4 16 MG         855    .770   14.33    287    15.185    9616      54     985      60    .077     4.2     76    4.6    18   16.0
5 19 MG         484    .450   14.60    100    15.098    7212      23     434      16    .057     1.3     25     .9     0   19.0
6 16 MG         799    .870   14.36    300    15.310    9616      50    1104      63    .077     3.9     85    4.8    18   16.0
7  3 MG        1053    .980   13.97   2125    15.055   22095     154    2899    1033    .113    17.4    328  116.7    93    3.0
8 16 MG         828    .970   14.36    275    15.413    9616      52    1222      57    .077     4.0     94    4.4    18   16.0
9 C.T.        28437   2.470    9.51     50    14.824    3720     714    1252       4    .143     102    179     .6     0   22.1
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     7.1     51    8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     6.7     53    8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     6.9     53    8.9
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(    6.7) + 0.65(    6.9) =    6.824   GM/BHP HR
                                      CO- NDIR 0.35(   52.6) + 0.65(   53.1) =   52.946   GM/BHP HR
                                      NO2-CL   0.35(    8.6) + 0.65(    8.9) =    8.808   GM/BHP HR
                                                           CORRECTED NO2 =    9.677   GM/BHP HR
                                                                    BSFC =     .882   LB/BHP HR
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                      TABLE F-10 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP  TEST-57  RUN-6   CARBURETOR JETS 63     07-26-73      K =1.083      HUM =109.2  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR         WT.       WEIGHTED GM/HR          MAN.
MODE           HC      CO     CO2     NO    CARBON    CONS.       HC       CO      NO2    FACT.    HC      CO     NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE        144   1.200   12.45     88    13.806     3720       42      653       8    .232     9.7    152     1.8    0    19.5
2 16 HG        80   1.320   14.07    368    15.476     9798       55     1688      77    .077     4.2    130     6.0   19    16.0
3 10 HG        56    .490   14.20   1515    14.750    15150       62     1017     517    .147     9.1    149    75.9   55    10.0
4 16 HG        59   1.410   14.02    350    15.494     9798       40     1801      73    .077     3.1    139     5.7   19    16.0
5 19 HG        41    .200   14.41    137    14.664     7167       22      198      22    .057     1.2     11     1.3    0    19.0
6 16 HG        56   1.370   14.05    408    15.480     9798       38     1752      86    .077     2.9    135     6.6   19    16.0
7  3 HG        62   1.540   13.62   1876    15.227    22952      101     4689     939    .113    11.4    530   106.1   95     3.0
8 16 HG        59   1.590   14.00    368    15.649     9798       40     2010      76    .077     3.1    155     5.9   19    16.0
9 C.T.       1775   1.730   11.18     84    14.827     3810      493      898       7    .143    70.4    128     1.0    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     4.7     62     8.5
1 IDLE        144   1.200   12.45     88    13.806     3720       42      653       8    .232     9.7    152     1.8    0    19.5
2 16 HG        60   1.470   13.93    374    15.465     9798       41     1881      79    .077     3.2    145     6.1   19    16.0
3 10 HG        50    .620   14.20   1540    14.874    15150       55     1276     521    .147     8.1    188    76.6   55    10.0
4 16 HG        56   1.610   13.97    360    15.640     9798       38     2037      75    .077     2.9    157     5.8   19    16.0
5 19 HG        38    .220   14.47    139    14.731     7167       20      216      22    .057     1.1     12     1.3    0    19.0
6 16 HG        53   1.520   13.99    389    15.567     9798       36     1933      81    .077     2.8    149     6.3   19    16.0
7  3 HG        60   1.530   13.70   2010    15.295    22952       97     4638    1001    .113    11.0    524   113.2   95     3.0
8 16 HG        56   1.670   13.91    350    15.640     9798       38     2113      73    .077     2.9    163     5.6   19    16.0
9 C.T.       1837   1.890   11.12     99    14.999     3810      504      970       8    .143    72.1    139     1.1    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     4.6     66     8.8
1 IDLE        136   1.270   13.16    116    14.577     3720       37      655      10    .232     8.7    152     2.3    0    19.5
2 16 HG        60   1.430   14.04    319    15.535     9798       41     1822      66    .077     3.1    140     5.1   19    16.0
3 10 HG        51    .570   14.22   1560    14.845    15150       56     1175     529    .147     8.3    173    77.7   55    10.0
4 16 HG        55   1.500   14.02    347    15.579     9798       37     1906      72    .077     2.9    147     5.6   19    16.0
5 19 HG        39    .260   14.44    155    14.742     7167       20      255      25    .057     1.2     15     1.4    0    19.0
6 16 HG        51   1.450   14.01    387    15.515     9798       35     1850      81    .077     2.7    142     6.2   19    16.0
7  3 HG        59   1.550   13.62   1944    15.234    22952       96     4717     972    .113    10.8    533   109.9   95     3.0
8 16 HG        53   1.560   13.95    369    15.567     9798       36     1983      77    .077     2.8    153     5.9   19    16.0
9 C.T.       1740   1.920   10.93     97    14.729     3810      486     1003       8    .143    69.5    143     1.2    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     4.4     65     8.7
1 IDLE        136   1.270   13.16    116    14.577     3720       37      655      10    .232     8.7    152     2.3    0    19.5
2 16 HG        64   1.460   13.98    347    15.509     9798       44     1863      73    .077     3.4    143     5.6   19    16.0
3 10 HG        51    .610   14.19   1499    14.865    15150       56     1257     508    .147     8.3    185    74.6   55    10.0
4 16 HG        56   1.590   13.91    347    15.560     9798       38     2022      73    .077     2.9    156     5.6   19    16.0
5 19 HG        34    .210   14.44    147    14.687     7167       18      207      24    .057     1.0     12     1.4    0    19.0
6 16 HG        53    .440   13.98    376    14.477     9798       39      602      84    .077     3.0     46     6.5   19    16.0
7  3 HG        60    .460   13.64   2101    14.165    22952      105     1506    1130    .113    11.9    170   127.7   95     3.0
8 16 HG        56   1.590   13.92    357    15.570     9798       38     2021      75    .077     2.9    156     5.7   19    16.0
9 C.T.       1852   1.850   10.91     91    14.760     3810      516      965       8    .143    73.8    138     1.1    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     4.7     47     9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     4.6     64     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     4.6     56     9.0
FOUR CYCLE COMPOSITE =                      HC- NDIR 0.35(     4.6) + 0.65(     4.6) =     4.589    GM/BHP HR
                                            CO- NDIR 0.35(    63.8) + 0.65(    55.7) =    58.551    GM/BHP HR
                                            NO2-NDIR 0.35(     8.7) + 0.65(     9.0) =     8.887    GM/BHP HR
                                                               CORRECTED NO2 =     9.629    GM/BHP HR
                                                                        BSFC =      .861    LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR         WT.       WEIGHTED GM/HR          MAN.
MODE          HC-FID    CO     CO2   NO-CL  CARBON    CONS.       HC       CO      NO2    FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE       3992   1.200   12.45     65    14.049     3720      104      642       6    .232    24.2    149     1.3    0    19.5
2 16 HG      1457   1.320   14.07    300    15.536     9798       92     1682      63    .077     7.1    129     4.8   19    16.0
3 10 HG       909    .490   14.20   1425    14.781    15150       93     1015     485    .147    13.7    149    71.3   55    10.0
4 16 HG      1343   1.410   14.02    287    15.564     9798       85     1793      60    .077     6.5    138     4.6   19    16.0
5 19 HG       255    .200   14.41    100    14.636     7167       13      198      16    .057      .7     11      .9    0    19.0
6 16 HG      1314   1.370   14.05    337    15.551     9798       83     1744      70    .077     6.4    134     5.4   19    16.0
7  3 HG      1283   1.540   13.62   1925    15.288    22952      193     4670     959    .113    21.8    528   108.4   95     3.0
8 16 HG      1459   1.590   14.00    300    15.736     9798       91     2000      62    .077     7.0    154     4.8   19    16.0
9 C.T.      24851   1.730   11.18     37    15.395     3810      615      865       3    .143    87.9    124      .4    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     7.1     61     8.2
1 IDLE       3992   1.200   12.45     65    14.049     3720      104      642       6    .232    24.2    149     1.3    0    19.5
2 16 HG      1542   1.470   13.93    300    15.554     9798       97     1870      63    .077     7.5    144     4.8   19    16.0
3 10 HG      1083    .620   14.20   1462    14.922    15150      104     1272     493    .147    15.3    187    72.4   55    10.0
4 16 HG      1402   1.610   13.97    300    15.720     9798       87     2027      62    .077     6.7    156     4.8   19    16.0
5 19 HG       318    .220   14.47    100    14.721     7167       15      216      16    .057      .9     12      .9    0    19.0
6 16 HG      1357   1.520   13.99    312    15.646     9798       85     1923      65    .077     6.5    148     5.0   19    16.0
7  3 HG      1266   1.530   13.70   2000    15.357    22952      189     4619     992    .113    21.4    522   112.1   95     3.0
8 16 HG      1387   1.670   13.91    287    15.719     9798       86     2103      59    .077     6.7    162     4.6   19    16.0
9 C.T.      27784   1.890   11.12     38    15.788     3810      670      921       3    .143    95.9    132      .4    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     7.5     65     8.3
1 IDLE       3514   1.270   13.16     75    14.781     3720       88      646       6    .232    20.5    150     1.5    0    19.5
2 16 HG      1372   1.430   14.04    275    15.607     9798       86     1813      57    .077     6.6    140     4.4   19    16.0
3 10 HG       966    .570   14.22   1450    14.887    15150       98     1172     490    .147    14.5    172    72.0   55    10.0
4 16 HG      1315   1.500   14.02    300    15.652     9798       82     1897      62    .077     6.3    146     4.8   19    16.0
5 19 HG       354    .260   14.44    112    14.735     7167       17      255      18    .057     1.0     15     1.0    0    19.0
6 16 HG      1229   1.450   14.01    312    15.583     9798       77     1842      65    .077     5.9    142     5.0   19    16.0
7  3 HG      1283   1.550   13.62   1875    15.298    22952      192     4697     934    .113    21.7    531   105.5   95     3.0
8 16 HG      1324   1.560   13.95    312    15.643     9798       83     1974      65    .077     6.4    152     5.0   19    16.0
9 C.T.      25286   1.920   10.93     38    15.379     3810      626      961       3    .143    89.6    137      .4    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     7.0     64     8.1
1 IDLE       3514   1.270   13.16     75    14.781     3720       88      646       6    .232    20.5    150     1.5    0    19.5
2 16 HG      1499   1.460   13.98    275    15.590     9798       94     1854      57    .077     7.3    143     4.4   19    16.0
3 10 HG       966    .610   14.19   1437    14.897    15150       98     1253     485    .147    14.4    184    71.3   55    10.0
4 16 HG      1286   1.590   13.91    287    15.629     9798       81     2014      60    .077     6.2    155     4.6   19    16.0
5 19 HG       255    .210   14.44    113    14.676     7167       12      207      18    .057      .7     12     1.0    0    19.0
6 16 HG      1232    .440   13.98    312    14.543     9798       83      599      70    .077     6.4     46     5.4   19    16.0
7  3 HG      1272    .460   13.64   2050    14.227    22952      205     1499    1098    .113    23.2    169   124.1   95     3.0
8 16 HG      1315   1.590   13.92    287    15.641     9798       82     2012      60    .077     6.3    155     4.6   19    16.0
9 C.T.      27951   1.850   10.91     50    15.555     3810      685      915       4    .143    97.9    131      .6    0    21.6
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     7.4     46     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     7.3     63     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     7.2     55     8.4
FOUR CYCLE COMPOSITE =                      HC- FID  0.35(     7.3) + 0.65(     7.2) =     7.223    GM/BHP HR
                                            CO- NDIR 0.35(    63.3) + 0.65(    55.2) =    58.009    GM/BHP HR
                                            NO2-CL   0.35(     8.3) + 0.65(     8.4) =     8.374    GM/BHP HR
                                                               CORRECTED NO2 =     9.072    GM/BHP HR
                                                                        BSFC =      .861    LB/BHP HR
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                     TABLE F-20 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-67  RUN-3   CARBURETOR JETS 64    07-26-73      K =1.062      HUM = 98.1  GR/LB
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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2      NO  CARBON   CONS.      HC      CO     NO2   FACT.    HC      CO     NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE         72   1.690  12.73     102  14.998    3720      20     876       9    .232    4.6    203     2.0     0    14.7
2 16 HG        71   2.920  13.01     313  16.007   10478      50    3861      68    .077    3.9    297     5.2    21    16.0
3 10 HG        72   1.670  13.64    1385  15.388   15513      78    3901     464    .147   11.5    500    68.1    55    10.0
4 16 HG        68   3.030  12.98     310  16.083   10478      48    3987      67    .077    3.7    307     5.2    21    16.0
5 19 HG        47   1.500  13.86     148  15.911    6985      23    1373      22    .057    1.3     78     1.3     0    19.0
6 16 HG        67   3.120  12.93     320  16.122   10478      47    4096      69    .077    3.6    315     5.3    21    16.0
7  3 HG        77   2.510  13.10    1761  15.693   23451     124    7577     874    .113   14.0    856    98.7    95     3.0
8 16 HG        71   3.080  12.91     310  16.067   10478      50    4057      67    .077    3.9    312     5.2    21    16.0
9 C.T.       1788   2.850   9.90      85  14.681    3765     495    1476       7    .143   70.8    211     1.0     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    4.6    121     7.6
1 IDLE         72   1.690  12.73     102  14.998    3720      20     876       9    .232    4.6    203     2.0     0    14.7
2 16 HG        82   3.170  12.87     282  16.129   10478      58    4160      61    .077    4.5    320     4.7    21    16.0
3 10 HG        75   1.840  13.62    1247  15.541   15513      81    3710     413    .147   11.9    545    60.7    55    10.0
4 16 HG        74   3.440  12.81     273  16.330   10478      51    4459      58    .077    3.9    343     4.5    21    16.0
5 19 HG        48   1.550  13.86     146  15.462    6985      23    1419      22    .057    1.3     81     1.2     0    19.0
6 16 HG        71   3.140  12.91     282  16.187   10478      50    4121      61    .077    3.8    317     4.7    21    16.0
7  3 HG        82   2.630  13.07    1677  15.789   23451     132    7891     827    .113   14.9    892    93.4    95     3.0
8 16 HG        73   3.240  12.91     305  16.229   10478      51    4226      65    .077    3.9    325     5.0    21    16.0
9 C.T.       1889   2.830   9.85     121  14.720    3765     522    1462      10    .143   74.6    209     1.5     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    4.9    127     7.0
1 IDLE        107   1.940  12.96     229  15.016    3720      29     971      19    .232    6.6    225     4.4     0    14.7
2 16 HG        77   3.310  12.85     316  16.293   10478      54    4313      68    .077    4.1    332     5.2    21    16.0
3 10 HG        76   1.880  13.60    1257  15.561   15513      81    3786     416    .147   11.9    557    61.2    55    10.0
4 16 HG        73   3.360  12.84     317  16.279   10478      51    4369      68    .077    3.9    336     5.2    21    16.0
5 19 HG        52   1.830  13.71     208  15.596    6985      25    1656      31    .057    1.4     94     1.8     0    19.0
6 16 HG        71   3.400  12.79     326  16.267   10478      49    4429      70    .077    3.8    341     5.4    21    16.0
7  3 HG        82   2.670  13.07    1721  15.829   23451     131    7991     847    .113   14.8    903    95.7    95     3.0
8 16 HG        72   3.170  12.86     334  16.108   10478      51    4165      72    .077    3.9    321     5.6    21    16.0
9 C.T.       1943   2.780   9.78     186  14.658    3765     539    1442      16    .143   77.1    206     2.3     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.0    130     7.3
1 IDLE        107   1.940  12.96     229  15.016    3720      29     971      19    .232    6.6    225     4.4     0    14.7
2 16 HG        77   3.170  12.93     399  16.183   10478      54    4145      86    .077    4.1    319     6.6    21    16.0
3 10 HG        76   1.910  13.59    1337  15.581   15513      81    3841     442    .147   11.9    565    65.0    55    10.0
4 16 HG        75   3.170  12.96     399  16.211   10478      52    4139      86    .077    4.0    319     6.6    21    16.0
5 19 HG        50   1.880  13.71     297  15.644    6985      24    1696      44    .057    1.4     97     2.5     0    19.0
6 16 HG        72   3.250  12.89     431  16.218   10478      50    4242      92    .077    3.9    327     7.1    21    16.0
7  3 HG        82   2.660  13.13    1778  15.879   23451     131    7936     872    .113   14.8    897    98.5    95     3.0
8 16 HG        72   3.390  12.80     428  16.268   10478      50    4411      92    .077    3.9    340     7.0    21    16.0
9 C.T.       1951   2.740   9.75     263  14.597    3765     543    1428      23    .143   77.7    204     3.2     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.0    129     7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    4.7    124     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    5.0    130     7.6
FOUR CYCLE COMPOSITE -
                                HC- NDIR 0.35(    4.7) + 0.65(    5.0) =     4.929   GM/BHP HR
                                CO- NDIR 0.35(  124.3) + 0.65(  130.0) =   127.969   GM/BHP HR
                                NO2-NDIR 0.35(    7.3) + 0.65(    7.6) =     7.501   GM/BHP HR
                                                    CORRECTED NO2 =     7.966   GM/BHP HR
                                                             BSFC =      .864   LB/BHP HR


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               CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE        HC-FID     CO     CO2   NO-CL  CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL  HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       1990   1.690  12.73      60  14.619    3720      49     869       5    .232   11.5    202     1.2     0    14.7
2 16 HG      2298   2.920  13.01     250  16.159   10478     149    3825      54    .077   11.5    294     4.1    21    16.0
3 10 HG      1931   1.670  13.64    1300  15.504   15513     194    3375     432    .147   28.5    496    63.5    55    10.0
4 16 HG      2166   3.030  12.98     265  16.227   10478     140    3952      57    .077   10.8    304     4.4    21    16.0
5 19 HG      1488   1.500  13.86     100  15.508    6985      67    1365      15    .057    3.8     78      .9     0    19.0
6 16 HG      2211   3.120  12.93     250  16.271   10478     142    4059      53    .077   11.0    313     4.1    21    16.0
7  3 HG      1974   2.510  13.10    1660  15.807   23451     293    7522     813    .113   33.1    850    91.8    95     3.0
8 16 HG      2137   3.080  12.91     260  16.204   10478     138    4023      56    .077   10.6    310     4.3    21    16.0
9 C.T.      29066   2.850   9.90      25  15.657    3765     699    1384       2    .143  100.0    198      .3     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    8.7    120     6.9
1 IDLE       1990   1.690  12.73      60  14.619    3720      49     869       5    .232   11.5    202     1.2     0    14.7
2 16 HG      2661   3.170  12.87     225  16.306   10478     171    4115      48    .077   13.2    317     3.7    21    16.0
3 10 HG      1893   1.840  13.62    1137  15.649   15513     183    3686     374    .147   26.9    542    55.0    55    10.0
4 16 HG      2084   3.440  12.81     220  16.458   10478     133    4424      46    .077   10.2    341     3.6    21    16.0
5 19 HG      1213   1.550  13.86      90  15.531    6985      55    1408      13    .057    3.1     80      .8     0    19.0
6 16 HG      2253   3.140  12.91     220  16.275   10478     145    4083      47    .077   11.2    314     3.6    21    16.0
7  3 HG      2078   2.630  13.07    1537  15.908   23451     306    7832     752    .113   34.6    885    85.0    95     3.0
8 16 HG      2284   3.240  12.91     225  16.378   10478     146    4187      48    .077   11.3    322     3.7    21    16.0
9 C.T.      28826   2.830   9.85      25  15.563    3765     697    1383       2    .143   99.7    198      .3     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    8.7    126     6.2
1 IDLE       3157   1.940  12.96      55  15.216    3720      77     958       4    .232   17.9    222     1.0     0    14.7
2 16 HG      2213   3.310  12.85     225  16.381   10478     142    4277      48    .077   10.9    329     3.7    21    16.0
3 10 HG      1871   1.880  13.60    1100  15.667   15513     185    3760     362    .147   27.2    553    53.2    55    10.0
4 16 HG      2213   3.360  12.84     210  16.421   10478     141    4331      44    .077   10.9    333     3.4    21    16.0
5 19 HG      1401   1.830  13.71      90  15.680    6985      62    1647      13    .057    3.6     94      .8     0    19.0
6 16 HG      2271   3.400  12.79     200  16.417   10478     145    4383      42    .077   11.2    338     3.3    21    16.0
7  3 HG      1961   2.670  13.07    1550  15.936   23451     289    7937     757    .113   32.6    897    85.6    95     3.0
8 16 HG      2210   3.170  12.86     190  16.251   10478     143    4129      41    .077   11.0    318     3.1    21    16.0
9 C.T.      29021   2.780   9.78      25  15.462    3765     707    1367       2    .143  101.1    196      .3     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    8.9    129     6.1
1 IDLE       3157   1.940  12.96      55  15.216    3720      77     958       4    .232   17.9    222     1.0     0    14.7
2 16 HG      2298   3.170  12.93     200  16.330   10478     147    4109      43    .077   11.4    316     3.3    21    16.0
3 10 HG      1944   1.910  13.59    1100  15.694   15513     192    3819     361    .147   28.2    561    53.1    55    10.0
4 16 HG      2241   3.170  12.96     200  16.354   10478     144    4103      43    .077   11.1    316     3.3    21    16.0
5 19 HG      1573   1.880  13.71      90  15.747    6985      70    1684      13    .057    4.0     96      .8     0    19.0
6 16 HG      2226   3.250  12.89     215  16.363   10478     143    4204      46    .077   11.0    324     3.5    21    16.0
7  3 HG      2019   2.660  13.13    1575  15.992   23451     296    7879     767    .113   33.5    890    86.6    95     3.0
8 16 HG      2300   3.390  12.80     200  16.420   10478     147    4370      42    .077   11.3    336     3.3    21    16.0
9 C.T.      29004   2.740   9.75      25  15.390    3765     710    1354       2    .143  101.5    194      .3     0    21.9
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    9.0    128     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    8.7    123     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    9.0    129     6.1
FOUR CYCLE COMPOSITE -
                                HC- FID  0.35(    8.7) + 0.65(    9.0) =     8.875   GM/BHP HR
                                CO- NDIR 0.35(  122.9) + 0.65(  128.5) =   126.554   GM/BHP HR
                                NO2-CL   0.35(    6.5) + 0.65(    6.1) =     6.238   GM/BHP HR
                                                    CORRECTED NO2 =     6.625   GM/BHP HR
                                                             BSFC =      .864   LB/BHP HR
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                 TABLE F-21  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP  TEST-58  RUN-2   AIR INJ. EXCEPT AT CT 07-30-73     K =1.035      HUM = 87.0  GR/LB
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            CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE         HC      CO     CO2     NO  CARBON   CONS.      HC      CO     NO2  FACT.    HC       CO     NO2   HP    VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE       29    .260    9.64     89   9.931    3493      11     185      10   .232    2.6       43     2.4    0   19.4
2 16 MG      26    .110   11.02    251  11.158    8936      22     178      67   .077    1.7       14     5.1   13   16.0
3 10 MG      28    .160   11.67   1225  11.860   13880      35     378     476   .147    5.2       56    70.0   48   10.0
4 16 MG      22    .100   11.14    314  11.264    8936      19     160      83   .077    1.5       12     6.4   13   16.0
5 19 MG      28    .180   13.33    169  13.540    7076      16     190      29   .057     .9       11     1.7    0   19.0
6 16 MG      23    .130   11.24    367  11.395    8936      19     206      96   .077    1.5       16     7.4   13   16.0
7  3 MG      29    .420   12.59   2194  13.041   21228      51    1381    1186   .113    5.8      156   134.0   90    3.0
8 16 MG      21    .110   11.26    352  11.393    8936      18     174      92   .077    1.4       13     7.1   13   16.0
9 C.T.     2056   2.300    8.21    166  12.730    3503     625    1308      16   .143   89.4      187     2.2    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.2       24    11.2
1 IDLE       29    .260    9.64     89   9.931    3493      11     185      10   .232    2.6       43     2.4    0   19.4
2 16 MG      29    .100   11.21    311  11.341    8936      25     159      81   .077    1.9       12     6.3   13   16.0
3 10 MG      29    .130   11.72   1254  11.881   13880      37     307     486   .147    5.4       45    71.5   48   10.0
4 16 MG      24    .100   11.17    352  11.296    8936      21     160      92   .077    1.6       12     7.1   13   16.0
5 19 MG      26    .230   13.38    198  13.638    7076      15     241      34   .057     .8       14     1.9    0   19.0
6 16 MG      26    .070   11.40    375  11.498    8936      22     110      97   .077    1.7        8     7.5   13   16.0
7  3 MG      28    .340   12.70   2204  13.070   21228      49    1115    1188   .113    5.5      126   134.3   90    3.0
8 16 MG      23    .130   11.24    389  11.395    8936      19     206     101   .077    1.5       16     7.8   13   16.0
9 C.T.     2093   2.330    8.23    195  12.820    3503     632    1315      18   .143   90.3      188     2.6    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.3       22    11.4
1 IDLE       36    .250   10.13    159  10.419    3493      13     169      18   .232    3.0       39     4.1    0   19.4
2 16 MG      27    .110   11.18    325  11.319    8936      23     175      85   .077    1.8       14     6.6   13   16.0
3 10 MG      26    .110   11.73   1248  11.868   13880      33     260     485   .147    4.8       38    71.2   48   10.0
4 16 MG      26    .090   11.09    358  11.208    8936      22     145      95   .077    1.7       11     7.3   13   16.0
5 19 MG      33    .170   13.27    228  13.476    7076      19     180      40   .057    1.1       10     2.3    0   19.0
6 16 MG      25    .150   11.34    394  11.517    8936      21     235     101   .077    1.6       18     7.8   13   16.0
7  3 MG      28    .310   12.68   2285  13.020   21228      49    1021    1237   .113    5.6      115   139.8   90    3.0
8 16 MG      24    .070   11.21    398  11.306    8936      20     112     104   .077    1.6        9     8.0   13   16.0
9 C.T.     2086   2.270    8.24    212  12.763    3503     632    1287      20   .143   90.4      184     2.8    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.3       21    11.8
1 IDLE       36    .250   10.13    159  10.419    3493      13     169      18   .232    3.0       39     4.1    0   19.4
2 16 MG      28    .120   11.31    353  11.460    8936      24     189      91   .077    1.8       15     7.0   13   16.0
3 10 MG      27    .130   11.76   1222  11.919   13880      34     306     472   .147    5.0       45    69.4   48   10.0
4 16 MG      24    .090   11.15    337  11.266    8936      21     144      89   .077    1.6       11     6.8   13   16.0
5 19 MG      41    .200   13.29    233  13.534    7076      23     211      40   .057    1.3       12     2.3    0   19.0
6 16 MG      27    .070   11.24    368  11.339    8936      23     111      96   .077    1.8        9     7.4   13   16.0
7  3 MG      25    .330   12.69   2222  13.047   21228      44    1085    1200   .113    5.0      123   135.6   90    3.0
8 16 MG      27    .070   11.20    355  11.299    8936      23     112      93   .077    1.8        9     7.2   13   16.0
9 C.T.     2075   2.190    8.24    206  12.671    3503     634    1251      19   .143   90.6      179     2.8    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    5.3       21    11.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    5.2       23    11.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    5.3       21    11.6
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(    5.2) + 0.65(    5.3) =    5.262   GM/BHP HR
                                       CO- NDIR 0.35(   23.0) + 0.65(   20.8) =   21.548   GM/BHP HR
                                       NO2-NDIR 0.35(   11.3) + 0.65(   11.6) =   11.518   GM/BHP HR
                                                          CORRECTED NO2 =   11.921   GM/BHP HR
                                                                   BSFC =     .929   LB/BHP HR


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            CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE        HC-FID   CO     CO2  NO-CL  CARBON   CONS.      HC      CO     NO2  FACT.  HC-FID     CO  NO2-CL  HP    VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE      369    .260    9.64     45   9.937    3493      13     185       5   .232    3.0       43     1.2    0   19.4
2 16 MG     125    .110   11.02    220  11.142    8936      10     178      59   .077     .8       14     4.5   13   16.0
3 10 MG     212    .160   11.67   1087  11.851   13880      25     379     423   .147    3.6       56    62.1   48   10.0
4 16 MG      97    .100   11.14    265  11.250    8936       8     160      70   .077     .6       12     5.4   13   16.0
5 19 MG     309    .180   13.33     90  13.541    7076      16     190      16   .057     .9       11      .9    0   19.0
6 16 MG      93    .130   11.24    270  11.379    8936       7     206      70   .077     .6       16     5.4   13   16.0
7  3 MG     231    .420   12.59   2050  13.033   21228      38    1382    1109   .113    4.2      156   125.3   90    3.0
8 16 MG      83    .110   11.26    300  11.378    8936       7     175      78   .077     .5       13     6.0   13   16.0
9 C.T.    30722   2.300    8.21     30  13.582    3503     810    1226       3   .143  115.9      175      .4    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.2       23    10.0
1 IDLE      369    .260    9.64     45   9.937    3493      13     185       5   .232    3.0       43     1.2    0   19.4
2 16 MG     138    .100   11.21    240  11.324    8936      11     159      63   .077     .8       12     4.8   13   16.0
3 10 MG     145    .130   11.72   1100  11.865   13880      17     307     427   .147    2.5       45    62.8   48   10.0
4 16 MG      80    .100   11.17    250  11.278    8936       6     160      66   .077     .5       12     5.1   13   16.0
5 19 MG     260    .230   13.38     85  13.636    7076      13     241      15   .057     .8       14      .8    0   19.0
6 16 MG      70    .070   11.40    265  11.477    8936       5     110      69   .077     .4        8     5.3   13   16.0
7  3 MG     155    .340   12.70   2100  13.055   21228      25    1117    1134   .113    2.8      126   128.1   90    3.0
8 16 MG      55    .130   11.24    270  11.376    8936       4     206      70   .077     .3       16     5.4   13   16.0
9 C.T.    31174   2.330    8.23     30  13.677    3503     817    1233       3   .143  116.8      176      .4    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.0       21    10.1
1 IDLE      822    .250   10.13     50  10.462    3493      27     169       6   .232    6.4       39     1.3    0   19.4
2 16 MG     327    .110   11.18    220  11.323    8936      26     175      58   .077    2.0       14     4.4   13   16.0
3 10 MG     145    .110   11.73   1150  11.855   13880      17     260     447   .147    2.5       38    65.7   48   10.0
4 16 MG      65    .090   11.09    250  11.187    8936       5     145      66   .077     .4       11     5.1   13   16.0
5 19 MG     387    .170   13.27     80  13.479    7076      20     180      14   .057    1.2       10      .8    0   19.0
6 16 MG      55    .150   11.34    260  11.496    8936       4     236      67   .077     .3       18     5.2   13   16.0
7  3 MG     155    .310   12.68   2175  13.005   21228      25    1022    1179   .113    2.9      115   133.2   90    3.0
8 16 MG      45    .070   11.21    270  11.285    8936       4     112      71   .077     .3        9     5.5   13   16.0
9 C.T.    30722   2.270    8.24     30  13.582    3503     810    1210       3   .143  115.9      173      .4    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.2       20    10.5
1 IDLE      822    .250   10.13     50  10.462    3493      27     169       6   .232    6.4       39     1.3    0   19.4
2 16 MG     128    .120   11.31    220  11.443    8936      10     189      57   .077     .8       15     4.4   13   16.0
3 10 MG     132    .130   11.76   1137  11.903   13880      15     306     440   .147    2.3       45    64.7   48   10.0
4 16 MG      70    .090   11.15    250  11.247    8936       6     144      66   .077     .4       11     5.1   13   16.0
5 19 MG     240    .200   13.29     85  13.514    7076      13     212      15   .057     .7       12      .8    0   19.0
6 16 MG      55    .070   11.24    250  11.316    8936       4     112      66   .077     .3        9     5.0   13   16.0
7  3 MG     133    .330   12.69   2175  13.033   21228      22    1086    1176   .113    2.5      123   132.9   90    3.0
8 16 MG      73    .070   11.20    250  11.277    8936       6     112      66   .077     .4        9     5.1   13   16.0
9 C.T.    30701   2.190    8.24     30  13.500    3503     815    1174       3   .143  116.5      168      .4    0   21.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    6.2       20    10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    6.1       22    10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    6.2       20    10.4
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(    6.1) + 0.65(    6.2) =    6.161   GM/BHP HR
                                       CO- NDIR 0.35(   22.4) + 0.65(   20.3) =   21.021   GM/BHP HR
                                       NO2-CL   0.35(   10.0) + 0.65(   10.4) =   10.295   GM/BHP HR
                                                          CORRECTED NO2 =   10.656   GM/BHP HR
                                                                   BSFC =     .929   LB/BHP HR
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                         TABLE F-22 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP   TEST 58  RUN-4    AIR INJECTION           07-31-73        K =1.042      HUM = 89.5  GR/LB
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MODE          CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR                 MAN.
               HC      CO     CO2     NO   CARBON   CONS.     HC     CO     NO2    FACT.    HC      CO     NO2     HP      VAC.
------------------------------------------------------------------------------------------------------------------------------------
1 IDLE         43    .470    9.74     63   10.256    3311
2 16 HG        20    .190   10.14    307   10.302    9253     15    306       7    .232     3.5     71     1.6      0     19.7
3 10 HG        19    .190   10.71   1308   10.921   19152     19    254      92    .077     1.5     20     7.0     19     16.0
4 16 HG        21    .180   10.12    309   10.323    9253     27    447     563    .147     3.9     73    82.7     47     10.0
5 19 HG        16    .160    9.52    123    9.694    6894     20    326      90    .077     1.6     25     7.0     19     16.0
6 16 HG        21    .180   10.30    308   10.503    9253     19    230      29    .057      .8     13     1.7      0     19.0
7  3 HG        21    .990   11.81   2268   12.273   21727     20    320      90    .077     1.5     25     6.9     19     16.0
8 16 HG        22    .150   10.28    333   10.454    9253     40   1573    1333    .113     4.5    170   150.6     91      3.0
9 C.T.       1906    .920    6.52     55    6.468    3538     21    268      98    .077     1.6     21     7.6     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   636    355       8    .143    40.8     51     1.1      0     22.2
1 IDLE         43    .470    9.74     63   10.256    3311                                   5.1     22    12.3
2 16 HG        21    .150   10.55    250   10.723    9253     15    306       7    .232     3.5     71     1.6      0     19.7
3 10 HG        21    .180   11.08   1237   11.283   19152     20    261      72    .077     1.5     20     5.5     19     16.0
4 16 HG        22    .160   10.64    277   10.824    9253     28    456     515    .147     4.2     67    75.7     47     10.0
5 19 HG        21    .150    9.70     94    9.873    6894     20    276      74    .077     1.6     21     6.1     19     16.0
6 16 HG        23    .190   10.69    295   10.855    9253     16    212      22    .057      .9     12     1.2      0     19.0
7  3 HG        20    .910   12.09   2168   12.522   21727     21    241      83    .077     1.6     19     6.4     19     16.0
8 16 HG        23    .200   10.64    320   10.865    9253     37   1937    1299    .113     4.2    162   141.1     91      3.0
9 C.T.       1979    .440    6.60     50    8.637    3530     21    344      90    .077     1.6     26     7.0     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   659    364       7    .143    93.6     52     1.0      0     22.2
1 IDLE         44    .330   10.24     51   10.618    3311                                   5.2     21    11.3
2 16 HG        26    .190   10.77    225   10.937    9253     15    208       5    .232     3.4     48     1.2      0     19.7
3 10 HG        22    .150   11.21   1217   11.384   19152     23    239      63    .077     1.8     18     4.9     19     16.0
4 16 HG        23    .150   10.39    277   10.565    9253     30    377     502    .147     4.3     55    73.8     47     10.0
5 19 HG        21    .150   10.30     97   10.473    6894     22    265      81    .077     1.7     20     6.2     19     16.0
6 16 HG        24    .050   10.68    278   10.756    9253     15    199      21    .057      .9     11     1.2      0     19.0
7  3 HG        21    .580   12.27   2245   12.873   21727     22     87      79    .077     1.7      7     6.1     19     16.0
8 16 HG        23    .180   10.67    278   10.875    9253     38   1977    1258    .113     4.3    223   142.2     91      3.0
9 C.T.       1563    .930    6.43     51    8.544    3538     21    309      79    .077     1.6     24     6.0     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   699    360       7    .143    99.9     51     1.0      0     22.2
1 IDLE         44    .330   10.24     51   10.618    3311                                   5.5     21    11.2
2 16 HG        26    .190   10.73    266   10.897    9253     15    208       5    .232     3.4     48     1.2      0     19.7
3 10 HG        26    .170   11.16   1213   11.358   19152     23    240      75    .077     1.8     18     5.8     19     16.0
4 16 HG        21    .190   10.68    277   10.893    9253     35    428     502    .147     5.1     63    73.8     47     10.0
5 19 HG        22    .190    9.68     92    9.894    6894     19    241      78    .077     1.5     19     6.0     19     16.0
6 16 HG        22    .120   10.73    280   10.874    9253     17    198      21    .057      .9     11     1.2      0     19.0
7  3 HG        24    .380   12.19   2170   12.596   21727     20    206      79    .077     1.6     16     6.1     19     16.0
8 16 HG        21    .180   10.59    297   10.793    9253     45   1324    1243    .113     5.1    150   140.9     91      3.0
9 C.T.       1588    .450    6.33     73    8.495    3538     19    312      86    .077     1.5     24     6.5     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   714    379      10    .143   108.1     54     1.9      0     22.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------      5.7     19    11.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------      5.1     21    11.8
FOUR CYCLE COMPOSITE -                                                                     5.6     20    11.2
                                   HC- NDIR 0.35(     5.1) + 0.65(     5.6) =    5.439   GM/BHP HR
                                   CO- NDIR 0.35(    21.4) + 0.65(    19.9) =   20.430   GM/BHP HR
                                   NO2-NDIR 0.35(    11.8) + 0.65(    11.2) =   11.415   GM/BHP HR
                                                       CORRECTED NO2 =   11.890   GM/BHP HR
                                                                BSFC =     .921   LB/BHP HR
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MODE          CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR                 MAN.
             HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC     CO     NO2    FACT.  HC-FID    CO   NO2-CL    HP      VAC.
------------------------------------------------------------------------------------------------------------------------------------
1 IDLE        308    .470    9.74     45   10.291    3311
2 16 HG        65    .190   10.14    280   10.285    9253     10    307       5    .232     2.3     71     1.1      0     19.7
3 10 HG       100    .190   10.71   1250   10.910   19152      5    254      84    .077      .4     20     6.4     19     16.0
4 16 HG        34    .180   10.12    294   10.303    9253     13    448     538    .147     1.9     73    79.1     47     10.0
5 19 HG        48    .160    9.52    100    9.685    6894      3    327      88    .077      .2     25     6.7     19     16.0
6 16 HG        31    .180   10.30    285   10.483    9253      3    230      24    .057      .2     13     1.3      0     19.0
7  3 HG       101    .940   11.81   2225   12.260   21727      3    321      84    .077      .2     25     6.4     19     16.0
8 16 HG        31    .150   10.28    313   10.433    9253     18   1575    1309    .113     2.0    178   147.9     91      3.0
9 C.T.      17878    .920    6.52     63    8.728    3538      3    269      92    .077      .2     21     7.1     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   725    344       8    .143   103.6     44     1.2      0     22.2
1 IDLE        308    .470    9.74     45   10.291    3311                                   5.1     22    11.9
2 16 HG       152    .150   10.55    248   10.715    9253     10    307       5    .232     2.3     71     1.1      0     19.7
3 10 HG       125    .180   11.08   1225   11.272   19152     13    262      71    .077     1.0     20     5.5     19     16.0
4 16 HG        76    .160   10.64    275   10.808    9253     16    456     511    .147     2.3     67    75.1     47     10.0
5 19 HG        72    .150    9.70     90    9.857    6894      6    277      78    .077      .5     21     6.0     19     16.0
6 16 HG        58    .190   10.69    290   10.836    9253      5    212      21    .057      .3     12     1.2      0     19.0
7  3 HG        98    .910   12.09   2107   12.510   21727      5    241      82    .077      .4     19     6.3     19     16.0
8 16 HG        48    .200   10.64    315   10.845    9253     17   1938    1215    .113     1.9    163   137.3     91      3.0
9 C.T.      18107    .440    6.60     44    8.851    3538      4    345      89    .077      .3     27     6.9     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   724    355       6    .143   103.5     51      .8      0     22.2
1 IDLE        338    .330   10.24     50   10.604    3311                                   5.2     21    11.1
2 16 HG       127    .190   10.77    225   10.923    9253     11    208       5    .232     2.4     48     1.2      0     19.7
3 10 HG       126    .150   11.21   1183   11.373   19152     11    240      63    .077      .8     18     4.9     19     16.0
4 16 HG        58    .150   10.39    280   10.546    9253     16    377     489    .147     2.3     55    71.8     47     10.0
5 19 HG        65    .150   10.30     80   10.456    6894      5    266      82    .077      .4     20     6.3     19     16.0
6 16 HG        47    .050   10.68    270   10.736    9253      4    200      18    .057      .2     11     1.0      0     19.0
7  3 HG       103    .580   12.27   2218   12.860   21727      4     87      77    .077      .3      7     5.9     19     16.0
8 16 HG        41    .180   10.67    275   10.854    9253     17   1979    1244    .113     2.0    224   140.6     91      3.0
9 C.T.      19447    .430    6.43     45    8.805    3538      3    310      78    .077      .3     24     6.0     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   781    349       6    .143   111.7     50      .9      0     22.2
1 IDLE        338    .330   10.24     50   10.604    3311                                   5.6     21    11.0
2 16 HG       127    .190   10.73    240   10.883    9253     11    208       5    .232     2.4     48     1.2      0     19.7
3 10 HG       149    .170   11.16   1150   11.345   19152     11    240      68    .077      .8     19     5.2     19     16.0
4 16 HG        72    .190   10.68    250   10.827    9253     19    428     476    .147     2.7     63    70.0     47     10.0
5 19 HG        68    .190    9.68     90    9.827    6894      6    242      71    .077      .5     19     5.5     19     16.0
6 16 HG        44    .120   10.73    270   10.854    9253      5    198      21    .057      .3     11     1.2      0     19.0
7  3 HG       118    .380   12.19   2118   12.582   21727      4    207      76    .077      .3     16     5.9     19     16.0
8 16 HG        37    .180   10.59    280   10.774    9253     20   1326    1214    .113     2.3    150   137.2     91      3.0
9 C.T.      19745    .450    6.33     35    8.755    3538      3    312      80    .077      .2     24     6.1     19     16.0
---------------CYCLE COMPOSITE IN GM/BHP HR---------------   798    367       5    .143   119.1     53      .7      0     22.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------      5.7     19    10.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------      5.2     21    11.5
FOUR CYCLE COMPOSITE -                                                                     5.6     20    10.9
                                   HC- FID  0.35(     5.2) + 0.65(     5.6) =    5.472   GM/BHP HR
                                   CO- NDIR 0.35(    21.4) + 0.65(    19.9) =   20.383   GM/BHP HR
                                   NO2-CL   0.35(    11.5) + 0.65(    10.9) =   11.098   GM/BHP HR
                                                       CORRECTED NO2 =   11.559   GM/BHP HR
                                                                BSFC =     .921   LB/BHP HR
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                  TABLE F-23 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST 59  RUN-1   DECEL / 1973 CALIF    07-31-73      K =1.091     HUM =113.7  GR/LB
------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE           HC     CO     CO2     NO     CARBON   CONS.     HC     CO     NO2     FACT.    HC      CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE         78  2.590   11.99    117    14.664    3493      20   1246      9     .232     4.7    289     2.1    0    19.6
2 16 MG        20   .230   13.35    289    13.602    8981      14    307     63     .077     1.1     24     4.9   14    16.0
3 10 MG        18   .210   12.98   1235    13.209   14016      21    450    435     .147     3.0     66    64.0   48    10.0
4 16 MG        17   .210   13.35    330    13.578    8981      12    281     72     .077      .9     22     5.6   14    16.0
5 19 MG        16   .160   13.40    165    13.577    7212       9    172     29     .057      .5     10     1.7    0    19.0
6 16 MG        16   .230   13.40    360    13.647    8981      11    306     79     .077      .9     24     6.1   14    16.0
7  3 MG        36  1.050   12.98   2142    14.069   21727      60   3276   1098     .113     6.8    370   124.1   93     3.0
8 16 MG        18   .370   13.48    364    13.869    8981      13    484     78     .077     1.0     37     6.0   14    16.0
9 C.T.         65   .910   13.23    133    14.210    5261      26    681     16     .143     3.7     97     2.3    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     1.0     43     9.9
1 IDLE         78  2.590   11.99    117    14.664    3493      20   1246      9     .232     4.7    289     2.1    0    19.6
2 16 MG        20   .260   13.36    310    13.642    8981      14    346     68     .077     1.1     27     5.2   14    16.0
3 10 MG        21   .280   13.10   1201    13.403   14016      24    591    417     .147     3.5     87    61.3   48    10.0
4 16 MG        16   .200   13.47    329    13.687    8981      11    265     72     .077      .9     20     5.5   14    16.0
5 19 MG        16   .230   13.44    143    13.687    7212       9    245     25     .057      .5     14     1.4    0    19.0
6 16 MG        18   .310   13.37    306    13.699    8981      13    411     67     .077     1.0     32     5.1   14    16.0
7  3 MG        38   .930   13.05   2240    14.021   21727      64   2911   1163     .113     7.2    329   131.4   93     3.0
8 16 MG        17   .260   13.50    302    13.778    8981      12    342     65     .077      .9     26     5.0   14    16.0
9 C.T.         79  1.000   13.11    127    14.195    5261      32    749     16     .143     4.5    107     2.2    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     1.1     43    10.0
1 IDLE        126  2.830   11.55    121    14.516    3493      33   1376     10     .232     7.6    319     2.2    0    19.6
2 16 MG        24   .400   13.14    309    13.566    8981      17    535     68     .077     1.3     41     5.2   14    16.0
3 10 MG        19   .300   12.83   1254    13.151   14016      22    646    445     .147     3.2     95    65.5   48    10.0
4 16 MG        19   .260   13.17    280    13.451    8981      14    351     62     .077     1.1     27     4.8   14    16.0
5 19 MG        19   .320   13.18    156    13.521    7212      11    345     28     .057      .6     20     1.6    0    19.0
6 16 MG        21   .410   13.11    330    13.543    8981      15    549     73     .077     1.2     42     5.6   14    16.0
7  3 MG        38  1.000   12.75   2262    13.791   21727      65   3182   1183     .113     7.3    360   133.7   93     3.0
8 16 MG        20   .260   13.10    346    13.382    8981      14    352     77     .077     1.1     27     5.9   14    16.0
9 C.T.         97  1.000   12.70    123    13.805    5261      40    770     16     .143     5.7    110     2.2    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     1.3     48    10.4
1 IDLE        126  2.830   11.55    121    14.516    3493      33   1376     10     .232     7.6    319     2.2    0    19.6
2 16 MG        25   .340   13.04    277    13.407    8981      18    460     62     .077     1.4     35     4.7   14    16.0
3 10 MG        19   .270   12.72   1246    13.011   14016      22    588    446     .147     3.2     86    65.5   48    10.0
4 16 MG        20   .420   13.03    295    13.472    8981      14    566     65     .077     1.1     44     5.0   14    16.0
5 19 MG        18   .310   13.08    123    13.409    7212      10    337     22     .057      .6     19     1.3    0    19.0
6 16 MG        19   .350   12.98    300    13.351    8981      14    476     67     .077     1.1     37     5.2   14    16.0
7  3 MG        39   .860   12.73   2259    13.632   21727      67   2769   1195     .113     7.6    313   135.1   93     3.0
8 16 MG        18   .390   13.04    304    13.449    8981      13    526     67     .077     1.0     41     5.2   14    16.0
9 C.T.         99   .970   12.73    120    13.807    5261      41    747     15     .143     5.8    107     2.2    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     1.3     46    10.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     1.1     43    10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     1.3     47    10.4
FOUR CYCLE COMPOSITE =
                                 HC- NDIR 0.35(     1.1) + 0.65(     1.3) =    1.244   GM/BHP HR
                                 CO- NDIR 0.35(    42.7) + 0.65(    46.7) =   45.283   GM/BHP HR
                                 NO2-NDIR 0.35(    10.0) + 0.65(    10.4) =   10.220   GM/BHP HR
                                                       CORRECTED NO2 =   11.146   GM/BHP HR
                                                                BSFC =     .933   LB/BHP HR


------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC     CO     NO2     FACT.  HC-FID     CO   NO2-CL  HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE       3275  2.590   11.99     50    14.908    3493      77   1226      4     .232    17.8    284      .9    0    19.6
2 16 MG       293   .230   13.35    240    13.609    8981      19    307     53     .077     1.5     24     4.0   14    16.0
3 10 MG       242   .210   12.98   1200    13.214   14016      26    450    423     .147     3.8     66    62.1   48    10.0
4 16 MG       134   .210   13.35    287    13.573    8981       9    281     63     .077      .7     22     4.9   14    16.0
5 19 MG       144   .160   13.40    100    13.574    7212       8    172     18     .057      .4     10     1.0    0    19.0
6 16 MG       162   .230   13.40    287    13.646    8981      11    306     63     .077      .8     24     4.8   14    16.0
7  3 MG      1057  1.050   12.98   2175    14.136   21727     163   3260   1110     .113    18.4    368   125.4   93     3.0
8 16 MG       264   .370   13.48    312    13.876    8981      17    484     67     .077     1.3     37     5.2   14    16.0
9 C.T.       1640   .910   13.23     50    14.304    5261      60    676      6     .143     8.6     97      .9    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     2.4     43     9.6
1 IDLE       3275  2.590   11.99     50    14.908    3493      77   1226      4     .232    17.8    284      .9    0    19.6
2 16 MG       293   .260   13.36    240    13.649    8981      19    346     52     .077     1.5     27     4.0   14    16.0
3 10 MG       283   .280   13.10   1187    13.408   14016      30    591    412     .147     4.4     87    60.6   48    10.0
4 16 MG       126   .200   13.47    275    13.683    8981       8    265     60     .077      .6     20     4.6   14    16.0
5 19 MG       144   .230   13.44    100    13.684    7212       8    245     17     .057      .4     14     1.0    0    19.0
6 16 MG       182   .310   13.37    270    13.698    8981      12    411     59     .077      .9     32     4.5   14    16.0
7  3 MG      1116   .930   13.05   2350    14.092   21727     172   2897   1203     .113    19.4    327   135.9   93     3.0
8 16 MG       249   .260   13.50    275    13.785    8981      16    342     59     .077     1.2     26     4.6   14    16.0
9 C.T.       2091  1.000   13.11     50    14.319    5261      77    742      6     .143    11.0    106      .9    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     2.6     42     9.9
1 IDLE       3314  2.830   11.55     50    14.711    3493      79   1357      4     .232    18.3    315      .9    0    19.6
2 16 MG       351   .400   13.14    260    13.575    8981      23    535     57     .077     1.8     41     4.4   14    16.0
3 10 MG       256   .300   12.83   1187    13.156   14016      27    646    420     .147     4.0     95    61.7   48    10.0
4 16 MG       150   .260   13.17    237    13.445    8981      10    351     53     .077      .8     27     4.0   14    16.0
5 19 MG       171   .320   13.18    112    13.517    7212       9    345     20     .057      .5     20     1.1    0    19.0
6 16 MG       213   .410   13.11    275    13.541    8981      14    549     61     .077     1.1     42     4.7   14    16.0
7  3 MG      1114  1.000   12.75   2387    13.861   21727     175   3166   1242     .113    19.7    358   140.4   93     3.0
8 16 MG       292   .260   13.10    280    13.389    8981      20    352     62     .077     1.5     27     4.8   14    16.0
9 C.T.       2295  1.000   12.70     60    13.930    5261      87    763      8     .143    12.4    109     1.1    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     2.7     47    10.2
1 IDLE       3314  2.830   11.55     50    14.711    3493      79   1357      4     .232    18.3    315      .9    0    19.6
2 16 MG       365   .340   13.04    205    13.417    8981      24    460     46     .077     1.9     35     3.5   14    16.0
3 10 MG       255   .270   12.72   1175    13.016   14016      28    587    420     .147     4.0     86    61.8   48    10.0
4 16 MG       157   .420   13.03    250    13.466    8981      10    566     55     .077      .8     44     4.3   14    16.0
5 19 MG       162   .310   13.08    100    13.406    7212       9    337     18     .057      .5     19     1.0    0    19.0
6 16 MG       192   .350   12.98    250    13.349    8981      13    476     56     .077     1.0     37     4.3   14    16.0
7  3 MG      1141   .860   12.73   2300    13.704   21727     181   2754   1211     .113    20.4    311   136.8   93     3.0
8 16 MG       261   .390   13.04    262    13.456    8981      18    526     58     .077     1.4     40     4.5   14    16.0
9 C.T.       2342   .970   12.73     55    13.934    5261      88    740      7     .143    12.6    106     1.0    0    20.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     2.8     45    10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     2.5     42     9.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     2.8     46    10.1
FOUR CYCLE COMPOSITE =            HC- FID  0.35(     2.5) + 0.65(     2.8) =    2.682   GM/BHP HR
                                  CO- NDIR 0.35(    42.4) + 0.65(    46.3) =   44.959   GM/BHP HR
                                  NO2-CL   0.35(     9.7) + 0.65(    10.1) =    9.963   GM/BHP HR
                                                        CORRECTED NO2 =   10.865   GM/BHP HR
                                                                 BSFC =     .933   LB/BHP HR
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                    TABLE F-24 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP  TEST 64  RUN-1   EGR SPCT. PINTLE 4-1  08-07-73      K =1.032      HUM = 85.9  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR                 MAN.
MODE           HC      CO     CO2      NO    CARBON   CONS.      HC      CO     NO2   FACT.     HC        CO     NO2     HP     VAC.
----------------------------------------------------------------------------------------------------------
1 IDLE        216   1.010   12.70     104    13.993    3447      58     504       9    .232    13.4      117     2.0     0     14.4
2 16 MG        38    .210   13.82     173    14.071    8437      25     254      34    .077     1.9       20     2.7     6     16.0
3 10 MG        21    .250   13.51     342    13.783   12928      21     474     107    .147     3.1       70    15.7    36     10.0
4 16 MG        30    .280   13.81     204    14.122    8437      19     338      40    .077     1.5       26     3.1     6     16.0
5 19 MG        11    .190   13.87     130    14.022    5988       5     121      18    .057      .3        7     1.1     0     19.0
6 16 MG        44    .290   13.79     199    14.128    8437      28     350      39    .077     2.2       27     3.0     6     16.0
7  3 MG        53    .510   13.44    2069    14.007   20412      83    1501    1001    .113     9.4      170   113.1    90      3.0
8 16 MG        22    .200   13.92     220    14.144    8437      14     241      44    .077     1.1       19     3.4     6     16.0
9 C.T.       1570   1.800   10.11     100    13.606    3901     486    1043      10    .143    69.5      149     1.4     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     5.9       35     8.3
1 IDLE        216   1.010   12.70     104    13.993    3447      58     504       9    .232    13.4      117     2.0     0     14.4
2 16 MG        59    .280   13.85     201    14.194    8437      38     336      40    .077     2.9       26     3.1     6     16.0
3 10 MG        28    .280   13.69     370    14.000   12928      28     522     113    .147     4.1       77    16.7    36     10.0
4 16 MG        32    .310   13.86     170    14.205    8437      21     372      34    .077     1.6       29     2.6     6     16.0
5 19 MG        21    .050   13.88     176    13.953    5988      10      43      25    .057      .6        2     1.4     0     19.0
6 16 MG        34    .230   13.56     210    13.827    8437      22     283      43    .077     1.7       22     3.3     6     16.0
7  3 MG        67    .650   13.02    2034    13.742   20412     107    1950    1003    .113    12.1      220   113.3    90      3.0
8 16 MG        25    .370   13.01     215    13.407    8437      17     470      45    .077     1.3       36     3.5     6     16.0
9 C.T.       1748   1.630   10.22      91    13.738    3901     536     935       9    .143    76.7      134     1.2     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     6.6       38     8.4
1 IDLE        169   1.190   12.88     102    14.253    3447      44     581       8    .232    10.2      135     1.9     0     14.4
2 16 MG        37    .240   13.82     167    14.100    8437      24     290      33    .077     1.8       22     2.6     6     16.0
3 10 MG        20    .160   13.54     388    13.722   12928      20     305     121    .147     3.0       45    17.8    36     10.0
4 16 MG        27    .280   13.81     186    14.119    8437      17     338      37    .077     1.3       26     2.8     6     16.0
5 19 MG        23    .260   13.85     118    14.135    5988      11     222      17    .057      .6       13      .9     0     19.0
6 16 MG        21    .200   13.78     191    14.003    8437      14     243      38    .077     1.1       19     2.9     6     16.0
7  3 MG        54    .680   13.51    2046    14.248   20412      84    1968     973    .113     9.4      222   110.0    90      3.0
8 16 MG        36    .320   13.85     203    14.209    8437      23     384      40    .077     1.8       30     3.1     6     16.0
9 C.T.       1368   1.660   10.28      80    13.417    3901     430     975       8    .143    61.4      139     1.1     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     5.2       37     8.2
1 IDLE        169   1.190   12.88     102    14.253    3447      44     581       8    .232    10.2      135     1.9     0     14.4
2 16 MG        45    .360   13.91     156    14.319    8437      29     428      31    .077     2.2       33     2.3     6     16.0
3 10 MG        33    .190   13.63     419    13.856   12928      33     358     130    .147     4.9       53    19.1    36     10.0
4 16 MG        39    .410   13.86     194    14.312    8437      25     488      38    .077     1.9       38     2.9     6     16.0
5 19 MG        28    .400   13.78     111    14.210    5988      13     340      16    .057      .7       19      .9     0     19.0
6 16 MG        23    .260   13.98     200    14.265    8437      15     311      39    .077     1.1       24     3.0     6     16.0
7  3 MG        58    .670   13.60    2065    14.333   20412      89    1927     976    .113    10.1      218   110.3    90      3.0
8 16 MG        32    .360   13.92     197    14.315    8437      20     429      39    .077     1.6       33     3.0     6     16.0
9 C.T.       1401   1.460   10.29      80    13.263    3901     445     867       8    .143    63.6      124     1.1     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     5.5       39     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------     6.2       36     8.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------     5.4       38     8.2
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     6.2) + 0.65(     5.4) =     5.662   GM/BHP HR
                                        CO- NDIR 0.35(    36.3) + 0.65(    38.0) =    37.436   GM/BHP HR
                                        NO2-NDIR 0.35(     8.4) + 0.65(     8.2) =     8.296   GM/BHP HR
                                                             CORRECTED NO2 =     8.561   GM/BHP HR
                                                                      BSFC =     1.075   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR                 MAN.
MODE         HC-FID    CO     CO2   NO-CL    CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID       CO  NO2-CL     HP     VAC.
----------------------------------------------------------------------------------------------------------
1 IDLE       3775   1.010   12.70      50    14.087    3447      92     499       4    .232    21.4      116      .9     0     14.4
2 16 MG       166    .210   13.82     130    14.097    8437      10     255      26    .077      .8       20     2.0     6     16.0
3 10 MG       134    .250   13.51     310    13.773   12928      13     474      97    .147     1.9       70    14.2    36     10.0
4 16 MG       110    .280   13.81     150    14.101    8437       7     338      30    .077      .5       26     2.3     6     16.0
5 19 MG        43    .190   13.87      90    14.014    5988       2     121      13    .057      .1        7      .7     0     19.0
6 16 MG       184    .290   13.79     150    14.098    8437      11     351      30    .077      .8       27     2.3     6     16.0
7  3 MG       910    .510   13.44    2013    14.041   20412     132    1498     972    .113    14.9      169   109.8    90      3.0
8 16 MG       120    .200   13.92     170    14.132    8437       7     241      34    .077      .6       19     2.6     6     16.0
9 C.T.      25978   1.800   10.11      30    14.508    3901     699     978       3    .143    99.9      140      .4     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     8.1       34     7.8
1 IDLE       3775   1.010   12.70      50    14.087    3447      92     499       4    .232    21.4      116      .9     0     14.4
2 16 MG       354    .280   13.85     140    14.165    8437      21     337      28    .077     1.6       26     2.1     6     16.0
3 10 MG       191    .280   13.69     345    13.989   12928      18     523     106    .147     2.6       77    15.6    36     10.0
4 16 MG       236    .310   13.86     165    14.194    8437      14     372      33    .077     1.1       29     2.5     6     16.0
5 19 MG       148    .050   13.88      80    13.945    5988       6      43      11    .057      .4        2      .7     0     19.0
6 16 MG       222    .230   13.56     155    13.812    8437      14     284      31    .077     1.0       22     2.4     6     16.0
7  3 MG      1126    .650   13.02    2087    13.783   20412     167    1945    1026    .113    18.9      220   116.0    90      3.0
8 16 MG       151    .370   13.01     170    13.395    8437       9     471      36    .077      .7       36     2.7     6     16.0
9 C.T.      26187   1.630   10.22      30    14.969    3901     706     888       3    .143   101.0      127      .4     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     8.5       38     8.2
1 IDLE       3108   1.190   12.88      50    14.381    3447      74     576       4    .232    17.3      134      .9     0     14.4
2 16 MG       318    .240   13.82     130    14.092    8437      19     290      26    .077     1.5       22     2.0     6     16.0
3 10 MG       154    .160   13.54     375    13.716   12928      15     305     117    .147     2.2       45    17.3    36     10.0
4 16 MG       258    .280   13.81     155    14.116    8437      15     338      31    .077     1.2       26     2.4     6     16.0
5 19 MG       166    .260   13.85      95    14.127    5988       7     223      12    .057      .4       13      .7     0     19.0
6 16 MG       163    .200   13.78     160    13.996    8437      10     244      32    .077      .8       19     2.5     6     16.0
7  3 MG       990    .680   13.51    2050    14.289   20412     141    1962     972    .113    16.0      222   109.9    90      3.0
8 16 MG       233    .320   13.85     175    14.193    8437      14     384      35    .077     1.1       30     2.7     6     16.0
9 C.T.      23097   1.660   10.28      30    14.250    3901     632     918       3    .143    90.4      131      .4     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     7.5       37     7.9
1 IDLE       3108   1.190   12.88      50    14.381    3447      74     576       4    .232    17.3      134      .9     0     14.4
2 16 MG       354    .360   13.91     140    14.305    8437      21     429      27    .077     1.6       33     2.1     6     16.0
3 10 MG       204    .190   13.63     385    13.840   12928      19     358     119    .147     2.8       53    17.6    36     10.0
4 16 MG       315    .410   13.86     155    14.301    8437      19     489      30    .077     1.4       38     2.3     6     16.0
5 19 MG       233    .400   13.78      80    14.203    5988      10     341      11    .057      .6       19      .6     0     19.0
6 16 MG       180    .260   13.98     160    14.258    8437      11     311      31    .077      .8       24     2.4     6     16.0
7  3 MG      1019    .670   13.60    2062    14.372   20412     145    1922     972    .113    16.4      217   109.9    90      3.0
8 16 MG       226    .360   13.92     165    14.303    8437      13     429      32    .077     1.0       33     2.5     6     16.0
9 C.T.      22839   1.460   10.29      30    14.034    3901     635     820       3    .143    90.8      117      .4     0     21.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------     7.6       38     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------     8.3       36     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------     7.6       38     8.0
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     8.3) + 0.65(     7.6) =     7.815   GM/BHP HR
                                        CO- NDIR 0.35(    35.8) + 0.65(    37.5) =    36.903   GM/BHP HR
                                        NO2-CL   0.35(     8.0) + 0.65(     8.0) =     7.963   GM/BHP HR
                                                             CORRECTED NO2 =     8.217   GM/BHP HR
                                                                      BSFC =     1.075   LB/BHP HR
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                      TABLE F-25 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-0P TEST-64   RUN-2   EGR 10PCT, PINTLE 4-1 08-07-73     K =1.112     HUM =134.1  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR           MAN.
MODE            HC     CO     CO2    NO      CARBON   CONS.      HC      CO      NO2    FACT.    HC      CO     NO2   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE         259  1.520  12.52     119    14.320    3266       64     700       9    .232    14.8     162     2.0    0   14.1
2 16 MG         84   .260  13.76     133    14.111    8528       55     317      27    .077     4.2      24     2.1    7   16.0
3 10 MG         70   .180  13.45     217    13.706   12610       70     335      66    .147    10.2      49     9.7   34   10.0
4 16 MG         70   .260  13.89     147    14.226    8528       45     315      29    .077     3.5      24     2.3    7   16.0
5 19 MG         71   .200  13.87     121    14.147    6033       33     172      17    .057     1.9      10     1.0    0   19.0
6 16 MG         64   .220  13.86     139    14.149    8528       42     268      28    .077     3.2      21     2.1    7   16.0
7  3 MG         84   .720  13.47    1861    14.281   20730      132    2111     897    .113    14.9     239   101.3   89    3.0
8 16 MG         61   .310  13.93     140    14.306    8528       39     373      28    .077     3.0      29     2.1    7   16.0
9 C.T.        1880  1.590   9.26      92    12.880    3477      548     867       8    .143    78.4     124     1.2    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      7.9      40     7.3
1 IDLE         259  1.520  12.52     119    14.320    3266       64     700       9    .232    14.8     162     2.0    0   14.1
2 16 MG         93   .310  13.75     140    14.160    8528       60     377      28    .077     4.7      29     2.2    7   16.0
3 10 MG         71   .270  13.53     253    13.877   12610       70     496      76    .147    10.2      73    11.2   34   10.0
4 16 MG         65   .290  13.83     185    14.190    8528       42     352      31    .077     3.2      27     2.4    7   16.0
5 19 MG         68   .340  13.99     117    14.403    6033       31     288      16    .057     1.8      16      .9    0   19.0
6 16 MG         61   .310  13.84     147    14.216    8528       40     376      29    .077     3.0      29     2.3    7   16.0
7  3 MG         75   .640  13.55    1881    14.271   20730      118    1878     907    .113    13.3     212   102.5   89    3.0
8 16 MG         57   .310  13.80     153    14.172    8528       37     377      31    .077     2.9      29     2.4    7   16.0
9 C.T.        1699  1.700   9.55      89    13.085    3477      488     913       8    .143    69.7     130     1.1    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      7.2      42     7.4
1 IDLE         178   .950  12.70     108    13.842    3266       45     453       8    .232    10.5     105     2.0    0   14.1
2 16 MG         64   .330  13.72     130    14.119    8528       42     403      26    .077     3.2      31     2.0    7   16.0
3 10 MG         54   .270  13.58     273    13.908   12610       53     494      82    .147     7.8      73    12.1   34   10.0
4 16 MG         52   .450  13.82     153    14.326    8528       33     541      30    .077     2.6      42     2.3    7   16.0
5 19 MG         54   .410  13.88     108    14.348    6033       25     348      15    .057     1.4      20      .9    0   19.0
6 16 MG         51   .310  13.94     154    14.305    8528       33     373      30    .077     2.5      29     2.3    7   16.0
7  3 MG         68   .670  13.58    2036    14.323   20730      106    1959     978    .113    12.0     221   110.5   89    3.0
8 16 MG         50   .400  13.88     158    14.334    8528       32     481      31    .077     2.5              2.4    7   16.0
9 C.T.        1631  1.620   9.70      83    13.081    3477      468     870       7    .143    67.0     124     1.0    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      6.9      40     7.9
1 IDLE         178   .950  12.70     108    13.842    3266       45     453       8    .232    10.5     105     2.0    0   14.1
2 16 MG         57   .280  13.79     123    14.132    8528       37     341      25    .077     2.9      26     1.9    7   16.0
3 10 MG         49   .230  13.53     242    13.813   12610       48     424      73    .147     7.1      62    10.8   34   10.0
4 16 MG         47   .330  13.83     137    14.211    8528       30     400      27    .077     2.3      31     2.1    7   16.0
5 19 MG         51   .460  13.83     123    14.345    6033       23     391      17    .057     1.3      22     1.0    0   19.0
6 16 MG         46   .350  13.71     142    14.110    8528       30     427      28    .077     2.3      33     2.2    7   16.0
7  3 MG         64   .650  13.49    2058    14.209   20730      101    1916     997    .113    11.4     216   112.6   89    3.0
8 16 MG         45   .250  13.82     132    14.119    8528       29     305      26    .077     2.3      23     2.0    7   16.0
9 C.T.        1597  1.610   9.81      85    13.145    3477      456     860       7    .143    65.2     123     1.1    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      6.2      38     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------      7.6      41     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------      6.3      39     8.0
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     7.6) + 0.65(      6.3) =     6.737   GM/BHP HR
                                    CO- NDIR 0.35(    40.8) + 0.65(     38.8) =    39.501   GM/BHP HR
                                    NO2-NDIR 0.35(     7.4) + 0.65(      8.0) =     7.741   GM/BHP HR
                                                             CORRECTED NO2 =     8.606   GM/BHP HR
                                                                      BSFC =     1.088   LB/BHP HR


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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR           MAN.
MODE           HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID    CO   NO2-CL  HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE        2994  1.520  12.52      45    14.339    3266       68     699       3    .232    15.8     162      .8    0   14.1
2 16 MG        289   .260  13.76      90    14.049    8528       18     319      18    .077     1.4      25     1.4    7   16.0
3 10 MG        235   .180  13.45     105    13.654   12610       22     336      57    .147     3.2      49     8.3   34   10.0
4 16 MG        191   .260  13.89     105    14.169    8528       12     316      21    .077      .9      24     1.6    7   16.0
5 19 MG        212   .200  13.87      80    14.091    6033        9     173      11    .057      .5      10      .6    0   19.0
6 16 MG        128   .220  13.86     105    14.093    8528        8     269      21    .077      .6      21     1.6    7   16.0
7  3 MG       1110   .720  13.47    1787    14.301   20730      161    2108     860    .113    18.2     238    97.2   89    3.0
8 16 MG        170   .310  13.93     100    14.257    8528       10     375      20    .077      .8      29     1.5    7   16.0
9 C.T.       29930  1.590   9.26      25    13.843    3477      752     807       2    .143   107.5     115      .3    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      8.7      39     6.6
1 IDLE        2994  1.520  12.52      45    14.339    3266       68     699       3    .232    15.8     162      .8    0   14.1
2 16 MG        318   .310  13.75     100    14.092    8528       19     379      20    .077     1.5      29     1.5    7   16.0
3 10 MG        289   .270  13.53     240    13.829   12610       26     497      73    .147     3.9      73    10.7   34   10.0
4 16 MG        248   .290  13.83     110    14.145    8528       15     353      22    .077     1.1      27     1.7    7   16.0
5 19 MG        227   .340  13.99      80    14.353    6033       10     284      11    .057      .5      16      .6    0   19.0
6 16 MG        226   .310  13.84     110    14.173    8528       14     377      22    .077     1.0      29     1.7    7   16.0
7  3 MG       1061   .640  13.55    1875    14.296   20730      154    1875     903    .113    17.4     212   102.0   89    3.0
8 16 MG        213   .310  13.80     110    14.131    8528       13     378      22    .077     1.0      29     1.7    7   16.0
9 C.T.       28706  1.700   9.55      25    14.121    3477      707     846       2    .143   101.1     121      .3    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      8.4      41     7.1
1 IDLE        3660   .950  12.70      55    14.016    3266       85     447       4    .232    19.8     104     1.0    0   14.1
2 16 MG        360   .330  13.72     100    14.086    8528       22     404      20    .077     1.7      31     1.5    7   16.0
3 10 MG        423   .270  13.58     230    13.892   12610       38     495      69    .147     5.6      73    10.2   34   10.0
4 16 MG        298   .450  13.82     110    14.300    8528       18     542      22    .077     1.4      42     1.7    7   16.0
5 19 MG        354   .410  13.88      80    14.325    6033       15     349      11    .057      .9      20      .6    0   19.0
6 16 MG        283   .310  13.94     110    14.278    8528       17     374      22    .077     1.3      29     1.7    7   16.0
7  3 MG       1097   .670  13.58    2000    14.360   20730      158    1954     959    .113    17.9     221   108.3   89    3.0
8 16 MG        233   .400  13.88     120    14.303    8528       14     482      24    .077     1.1      37     1.8    7   16.0
9 C.T.       29164  1.620   9.70      25    14.236    3477      712     799       2    .143   101.9     114      .3    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      8.9      39     7.5
1 IDLE        3660   .950  12.70      55    14.016    3266       85     447       4    .232    19.8     104     1.0    0   14.1
2 16 MG        367   .280  13.79     100    14.107    8528       22     342      20    .077     1.7      26     1.5    7   16.0
3 10 MG        232   .230  13.53     215    13.783   12610       21     425      65    .147     3.1      62     9.6   34   10.0
4 16 MG        244   .330  13.83     110    14.184    8528       15     401      22    .077     1.1      31     1.7    7   16.0
5 19 MG        283   .460  13.83      80    14.318    6033       12     392      11    .057      .7      22      .6    0   19.0
6 16 MG        297   .350  13.71     105    14.085    8528       15     428      21    .077     1.2      33     1.6    7   16.0
7  3 MG       1081   .650  13.49    2012    14.248   20730      157    1910     978    .113    17.8     216   109.8   89    3.0
8 16 MG        198   .250  13.82     105    14.090    8528       12     306      21    .077      .9      24     1.6    7   16.0
9 C.T.       26535  1.610   9.81      25    14.074    3477      656     803       2    .143    93.7     115      .3    0   21.9
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------      8.2      37     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------      8.6      40     6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------      8.5      38     7.5
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     8.6) + 0.65(      8.5) =     8.552   GM/BHP HR
                                    CO- NDIR 0.35(    40.2) + 0.65(     38.2) =    38.912   GM/BHP HR
                                    NO2-CL   0.35(     6.9) + 0.65(      7.5) =     7.264   GM/BHP HR
                                                             CORRECTED NO2 =     8.076   GM/BHP HR
                                                                      BSFC =     1.088   LB/BHP HR
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                         TABLE F-26 MASS EMISSIONS BY NINE-MODE FTP
ENGINE [illegible]-HP TEST-64   RUN-3   EGR 15PCT. PINTLE 4-1 08-07-74       K =1.074      HUM =103.8  GR/LB
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MODE          CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
               HC      CO     CO2    NO   CARBON   CONS.     HC     CO     NO2    FACT.    HC       CO    NO2    HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        119    .840  13.20    113   14.169    3311     30    397      9    .232     7.0      92    2.0     0    13.5
2 16 HG        51    .330  14.16    122   14.545    8437     32    387     23    .077     2.5      30    1.8     7    16.0
3 10 HG        58    .210  13.74    155   14.013   12020     54    364     44    .147     7.9      53    6.5    25    10.0
4 16 HG        46    .360  14.20    137   14.610    8437     29    420     26    .077     2.2      32    2.0     7    16.0
5 19 HG        44    .350  14.21    126   14.608   61024    199   2954    175    .057    11.3     168   10.0     7    19.0
6 16 HG        46    .330  14.17    156   14.550    8437     29    387     30    .077     2.2      30    2.3     7    16.0
7  3 HG        62    .890  13.76   1695   14.717   20502     93   2504    784    .113    10.5     283   88.6    86     3.0
8 16 HG        40    .420  14.19    149   14.653    8437     25    488     28    .077     1.9      38    2.2     7    16.0
9 C.T.       1476   1.370  10.22     86   13.184    3493    422    733      8    .143    60.4     105    1.1     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        6.7      53    7.4
1 IDLE        119    .840  13.20    113   14.169    3311     30    397      9    .232     7.0      92    2.0     0    13.5
2 16 HG        54    .430  14.11    136   14.598    8437     34    502     26    .077     2.6      39    2.0     7    16.0
3 10 HG        49    .180  13.81    155   14.043   12020     45    311     44    .147     6.7      46    6.5    25    10.0
4 16 HG        39    .540  14.03    153   14.612    8437     24    630     29    .077     1.9      48    2.3     7    16.0
5 19 HG        40    .380  14.13    116   14.553   61024    181   3219    161    .057    10.3     183    9.2     7    19.0
6 16 HG        38    .480  14.10    153   14.621    8437     24    560     29    .077     1.8      43    2.3     7    19.0
7  3 HG        61    .930  13.75   1754   14.746   20502     92   2612    810    .113    10.4     295   91.5     7    16.0
8 16 HG        39    .450  14.21    157   14.702    8437     24    522     30    .077     1.9      40    2.3    86     3.0
9 C.T.       1261   1.780   6.78     85    9.922    3493    479   1266     10    .143    68.6     181    1.4     7    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        7.0      61    7.5     0    22.0
1 IDLE        206    .650  13.24    103   14.112    3311     52    308      8    .232    12.1      71    1.9     0    13.5
2 16 HG        41    .420  14.00    142   14.464    8437     26    495     27    .077     2.0      38    2.1     7    16.0
3 10 HG        38    .210  12.70    155   12.951   12020     38    394     48    .147     5.6      58    7.0    25    10.0
4 16 HG        31    .470  13.73    148   14.233    8437     20    563     29    .077     1.5      43    2.2     7    16.0
5 19 HG        30    .240  13.96    117   14.232   61024    139   2079    167    .057     7.9     118    9.5     7    19.0
6 16 HG        35    .560  14.06    146   14.668    8437     22    651     28    .077     1.7      50    2.1     7    16.0
7  3 HG        52    .790  13.81   1728   14.656   20502     79   2232    803    .113     8.9     252   90.7    86     3.0
8 16 HG        35    .390  14.22    160   14.648    8437     22    459     31    .077     1.7      35    2.4     7    16.0
9 C.T.       1358   1.170  10.54     78   13.177    3493    389    627      7    .143    55.6      90    1.0     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        6.1      48    7.5
1 IDLE        206    .650  13.24    103   14.112    3311     52    308      8    .232    12.1      71    1.9     0    13.5
2 16 HG        50    .490  14.09    138   14.634    8437     31    571     26    .077     2.4      44    2.0     7    16.0
3 10 HG        41    .310  13.96    151   14.314   12020     37    526     42    .147     5.5      77    6.2    25    10.0
4 16 HG        39    .420  14.24    157   14.702    8437     24    487     30    .077     1.9      37    2.3     7    16.0
5 19 HG        44    .390  14.15    105   14.588   61024    199   3296    146    .057    11.3     188    8.3     7    19.0
6 16 HG        41    .580  14.17    154   14.794    8437     25    668     29    .077     1.9      51    2.2     7    16.0
7  3 HG        55    .880  13.84   1805   14.779   20502     82   2466    831    .113     9.3     279   93.9    86     3.0
8 16 HG        37    .430  14.25    151   14.720    8437     23    498     29    .077     1.8      38    2.2     7    16.0
9 C.T.       1304   1.020  10.69     83   13.124    3493    376    548      7    .143    53.8      78    1.0     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        6.3      55    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------        6.9      57    7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------        6.2      51    7.6
FOUR CYCLE COMPOSITE -
                                       HC- NDIR 0.35(      6.9) + 0.65(      6.2) =     6.445   GM/BHP HR
                                       CO- NDIR 0.35(     56.8) + 0.65(     51.2) =    53.196   GM/BHP HR
                                       NO2-NDIR 0.35(      7.5) + 0.65(      7.6) =     7.520   GM/BHP HR
                                                               CORRECTED NO2 =     8.074   GM/BHP HR
                                                                        BSFC =     1.592   LB/BHP HR
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MODE          CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
             HC-FID    CO     CO2  NO-CL  CARBON   CONS.     HC     CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       2825    .840  13.20     50   14.322    3311     65    392      4    .232    15.1      91     .9     0    13.5
2 16 HG       270    .330  14.16     90   14.517    8437     16    387     17    .077     1.2      30    1.3     7    16.0
3 10 HG       565    .210  13.74    110   14.006   12020     48    364     31    .147     7.1      54    4.6    25    10.0
4 16 HG       213    .360  14.20     95   14.581    8437     12    421     18    .077     1.0      32    1.4     7    16.0
5 19 HG       213    .350  14.21     80   14.581   61024     89   2959    111    .057     5.1     169    6.3     7    19.0
6 16 HG       290    .330  14.17     95   14.529    8437     17    387     18    .077     1.3      30    1.4     7    16.0
7  3 HG      1306    .890  13.76   1675   14.781   20502    181   2494    771    .113    20.5     282   87.2    86     3.0
8 16 HG       327    .420  14.19    110   14.643    8437     19    489     21    .077     1.5      38    1.6     7    16.0
9 C.T.      24801   1.370  10.22     20   14.070    3493    616    687      2    .143    88.0      98     .2     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        8.9      52    6.6
1 IDLE       2825    .840  13.20     50   14.322    3311     65    392      4    .232    15.1      91     .9     0    13.5
2 16 HG       482    .430  14.11     90   14.588    8437     28    502     17    .077     2.1      39    1.3     7    16.0
3 10 HG       466    .180  13.81    135   14.037   12020     40    311     38    .147     5.9      46    5.6    25    10.0
4 16 HG       426    .540  14.03    105   14.613    8437     25    630     20    .077     1.9      48    1.5     7    16.0
5 19 HG       425    .380  14.13     70   14.553   61024    178   3219     97    .057    10.2     183    5.6     7    19.0
6 16 HG       361    .480  14.10    110   14.616    8437     21    560     21    .077     1.6      43    1.6     7    16.0
7  3 HG      1206    .930  13.75   1700   14.801   20502    167   2602    782    .113    18.9     294   88.3    86     3.0
8 16 HG       319    .450  14.21    130   14.692    8437     18    522     25    .077     1.4      40    1.9     7    16.0
9 C.T.      22015   1.780   6.78     20   10.762    3493    715   1167      2    .143   102.2     167     .3     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------       10.1      60    6.8
1 IDLE       3385    .650  13.24     50   14.229    3311     79    306      4    .232    18.3      71     .9     0    13.5
2 16 HG       468    .420  14.00     80   14.467    8437     27    495     15    .077     2.1      38    1.2     7    16.0
3 10 HG       308    .210  12.70    130   12.941   12020     29    394     40    .147     4.2      58    5.9    25    10.0
4 16 HG       411    .470  13.73    110   14.241    8437     24    562     22    .077     1.9      43    1.7     7    16.0
5 19 HG       226    .240  13.96     70   14.223   61024     97   2080    100    .057     5.5     119    5.7     7    19.0
6 16 HG       341    .560  14.06    100   14.654    8437     20    651     19    .077     1.5      50    1.5     7    16.0
7  3 HG      1065    .790  13.81   1625   14.706   20502    148   2225    752    .113    16.8     251   85.0    86     3.0
8 16 HG       299    .390  14.22    120   14.640    8437     17    454     23    .077     1.3      35    1.8     7    16.0
9 C.T.      21723   1.170  10.54     20   13.882    3493    547    595      2    .143    78.2      85     .2     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        8.2      47    6.6
1 IDLE       3385    .650  13.24     50   14.229    3311     79    306      4    .232    18.3      71     .9     0    13.5
2 16 HG       461    .490  14.09     90   14.626    8437     27    571     17    .077     2.0      44    1.3     7    16.0
3 10 HG       311    .310  13.96    130   14.301   12020     26    526     36    .147     3.8      77    5.3    25    10.0
4 16 HG       426    .420  14.24    110   14.703    8437     24    487     21    .077     1.9      37    1.6     7    16.0
5 19 HG       496    .390  14.15     70   14.590   61024    207   3295     97    .057    11.8     188    5.5     7    19.0
6 16 HG       413    .580  14.17    100   14.791    8437     24    668     19    .077     1.8      51    1.5     7    16.0
7  3 HG      1009    .880  13.84   1750   14.821   20502    140   2459    804    .113    15.8     278   90.8    86     3.0
8 16 HG       356    .430  14.25    120   14.716    8437     20    498     23    .077     1.6      38    1.8     7    16.0
9 C.T.      20836   1.020  10.69     20   13.794    3493    528    522      2    .143    75.5      75     .2     0    22.0
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------        8.4      54    6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------        9.5      56    6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------        8.3      51    6.7
FOUR CYCLE COMPOSITE -
                                       HC- FID  0.35(      9.5) + 0.65(      8.3) =     8.706   GM/BHP HR
                                       CO- NDIR 0.35(     56.1) + 0.65(     50.9) =    52.701   GM/BHP HR
                                       NO2-CL   0.35(      6.7) + 0.65(      6.7) =     6.717   GM/BHP HR
                                                               CORRECTED NO2 =     7.212   GM/BHP HR
                                                                        BSFC =     1.592   LB/BHP HR
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                         TABLE F-27 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP TEST-64   RUN-4   EGR VALVE 2-1          08-08-73     K =1.080      HUM =107.3  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE        HC      CO     CO2     NO    CARBON   CONS.      HC       CO    NO2    FACT.   HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE     131    .820   12.55     92   13.511    3402      36      417      8    .232    8.3       97     1.8     0   14.0
2 16 HG     43    .160   13.46    101   13.666    8618      29      204     21    .077    2.3       16     1.6     6   16.0
3 10 HG     33    .130   13.39    298   13.556   12837      34      249     94    .147    5.0       37    13.8    36   10.0
4 16 HG     32    .170   13.72    145   13.925    8618      21      213     30    .077    1.6       16     2.3     6   16.0
5 19 HG     27    .090   13.67    117   13.789    6219      13       82     18    .057     .7        5     1.0     0   19.0
6 16 HG     23    .170   13.74    121   13.935    8618      15      212     25    .077    1.2       16     1.9     6   16.0
7  3 HG     38    .610   13.37   1598   14.021   20956      61     1842    793    .113    6.9      208    89.6    88    3.0
8 16 HG     21    .120   13.73    149   13.873    8618      14      151     31    .077    1.1       12     2.4     3   16.0
9 C.T.    1810   1.840    9.52     89   13.315    3765     553     1051      8    .143   79.0      150     1.2     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   6.3       33     6.9
1 IDLE     131    .820   12.55     92   13.511    3402      36      417      8    .232    8.3       97     1.8     0   14.0
2 16 HG     27    .200   13.68    159   13.909    8618      18      250     33    .077    1.4       19     2.5     6   16.0
3 10 HG     21    .100   13.38    331   13.503   12837      22      192    104    .147    3.2       28    15.4    36   10.0
4 16 HG     22    .170   13.74    157   13.934    8618      15      212     32    .077    1.1       16     2.5     6   16.0
5 19 HG     24    .110   13.70    141   13.836    6219      12      100     21    .057     .7        6     1.2     0   19.0
6 16 HG     23    .110   13.83    121   13.965    8618      15      137     25    .077    1.2       11     1.9     6   16.0
7  3 HG     40    .570   13.47   1544   14.083   20956      64     1713    763    .113    7.3      194    86.2    88    3.0
8 16 HG     23    .110   13.81    152   13.945    8618      15      137     31    .077    1.2       11     2.4     3   16.0
9 C.T.    1709   1.590    9.83     89   13.266    3765     524      912      8    .143   74.9      130     1.2     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   5.9       30     6.8
1 IDLE     177   1.020   12.61     85   13.821    3402      47      507      7    .232   10.9      118     1.6     0   14.0
2 16 HG     31    .200   13.74    128   13.973    8618      21      249     26    .077    1.6       19     2.0     6   16.0
3 10 HG     25    .100   13.37    327   13.497   12837      26      192    103    .147    3.8       28    15.2    36   10.0
4 16 HG     24    .190   13.73    171   13.946    8618      16      237     35    .077    1.2       18     2.7     6   16.0
5 19 HG     24    .150   13.73     98   13.906    6219      12      135     15    .057     .7        8      .8     0   19.0
6 16 HG     25    .160   13.75    126   13.937    8618      17      200     26    .077    1.3       15     2.0     6   16.0
7  3 HG     42    .500   13.50   1600   14.045   20956      68     1507    793    .113    7.6      170    89.6    88    3.0
8 16 HG     26    .140   13.68    111   13.848    8618      17      176     23    .077    1.3       14     1.8     3   16.0
9 C.T.    1698   1.450    9.86     81   13.144    3765     525      839      8    .143   75.1      120     1.1     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   6.2       30     7.0
1 IDLE     177   1.020   12.61     85   13.821    3402      47      507      7    .232   10.9      118     1.6     0   14.0
2 16 HG     36    .230   13.68    165   13.949    8618      24      287     34    .077    1.8       22     2.6     6   16.0
3 10 HG     25    .130   13.38    329   13.537   12837      26      249    104    .147    3.8       37    15.2    36   10.0
4 16 HG     27    .200   13.79    136   14.019    8618      18      248     28    .077    1.4       19     2.1     6   16.0
5 19 HG     26    .170   13.68    129   13.878    6219      13      154     19    .057     .7        9     1.1     0   19.0
6 16 HG     28    .240   13.67    180   13.940    8618      19      300     25    .077    1.4       23     1.9     6   16.0
7  3 HG     43    .490   13.52   1584   14.056   20956      69     1476    784    .113    7.8      167    88.6    88    3.0
8 16 HG     26    .150   13.68    167   13.858    8618      17      188     34    .077    1.3       15     2.7     3   16.0
9 C.T.    1781   1.450    9.78     82   13.159    3765     551      838      8    .143   78.7      120     1.1     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   6.4       31     7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   6.1       32     6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   6.3       31     7.0
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(    6.1) + 0.65(    6.3) =    6.232   GM/BHP HR
                                  CO- NDIR 0.35(   31.8) + 0.65(   30.9) =   31.224   GM/BHP HR
                                  NO2-NDIR 0.35(    6.9) + 0.65(    7.0) =    6.924   GM/BHP HR
                                                     CORRECTED NO2 =    7.479   GM/BHP HR
                                                              BSFC =    1.128   LB/BHP HR
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE       HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC       CO    NO2    FACT.   HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE    2416    .820   12.55     50   13.612    3402      60      414      4    .232   14.0       96     1.0     0   14.0
2 16 HG    366    .160   13.46     90   13.657    8618      23      204     19    .077    1.8       16     1.5     6   16.0
3 10 HG    204    .130   13.39    295   13.540   12837      19      249     93    .147    2.8       37    13.6    36   10.0
4 16 HG    148    .170   13.72    100   13.905    8618       9      213     21    .077     .7       16     1.6     6   16.0
5 19 HG    176    .090   13.67     80   13.778    6219       8       82     12    .057     .5        5      .7     0   19.0
6 16 HG    116    .170   13.74     95   13.922    8618       7      213     20    .077     .6       16     1.5     6   16.0
7  3 HG    975    .610   13.37   1550   14.077   20956     145     1834    766    .113   16.4      207    86.6    88    3.0
8 16 HG    134    .120   13.73    130   13.863    8618       8      151     27    .077     .6       12     2.1     3   16.0
9 C.T.   27406   1.840    9.52     20   14.101    3765     732      992      2    .143  104.6      142      .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   8.5       33     6.5
1 IDLE    2416    .820   12.55     50   13.612    3402      60      414      4    .232   14.0       96     1.0     0   14.0
2 16 HG    282    .200   13.68     90   13.908    8618      17      250     19    .077    1.3       19     1.4     6   16.0
3 10 HG    175    .100   13.38    310   13.498   12837      17      192     98    .147    2.5       28    14.4    36   10.0
4 16 HG    156    .170   13.74    110   13.926    8618      10      213     23    .077     .7       16     1.7     6   16.0
5 19 HG    141    .110   13.70     80   13.824    6219       6      100     12    .057     .4        6      .7     0   19.0
6 16 HG    141    .110   13.83    120   13.954    8618       9      137     25    .077     .7       11     1.9     6   16.0
7  3 HG    995    .570   13.47   1537   14.140   20956     148     1706    756    .113   16.7      193    85.5    88    3.0
8 16 HG    148    .110   13.81    120   13.935    8618       9      137     25    .077     .7       11     1.9     3   16.0
9 C.T.   22997   1.590    9.83     20   13.720    3765     631      881      2    .143   90.2      126      .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   7.6       30     6.5
1 IDLE    3603   1.020   12.61     50   13.990    3402      88      501      4    .232   20.3      116      .9     0   14.0
2 16 HG    508    .200   13.74     85   13.991    8618      31      249     17    .077    2.4       19     1.3     6   16.0
3 10 HG    352    .100   13.37    320   13.505   12837      33      192    101    .147    4.9       28    14.8    36   10.0
4 16 HG    226    .190   13.73    130   13.943    8618      14      237     27    .077    1.1       18     2.1     6   16.0
5 19 HG    184    .150   13.73     80   13.898    6219       8      135     12    .057     .5        8      .7     0   19.0
6 16 HG    169    .160   13.75    100   13.927    8618      10      200     21    .077     .8       15     1.6     6   16.0
7  3 HG    896    .500   13.50   1600   14.090   20956     133     1502    790    .113   15.1      170    89.3    88    3.0
8 16 HG    156    .140   13.68    105   13.836    8618      10      176     22    .077     .7       14     1.7     3   16.0
9 C.T.   22534   1.450    9.86     20   13.563    3765     626      813      2    .143   89.4      116      .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   8.1       30     6.7
1 IDLE    3603   1.020   12.61     50   13.990    3402      88      501      4    .232   20.3      116      .9     0   14.0
2 16 HG    360    .230   13.68    115   13.946    8618      22      287     24    .077    1.7       22     1.8     6   16.0
3 10 HG    218    .130   13.38    300   13.532   12837      21      249     94    .147    3.0       37    13.9    36   10.0
4 16 HG    191    .200   13.79    110   14.009    8618      12      249     22    .077     .9       19     1.7     6   16.0
5 19 HG    232    .170   13.68     80   13.873    6219      10      154     12    .057     .6        9      .7     0   19.0
6 16 HG    212    .240   13.67     95   13.931    8618      13      300     20    .077    1.0       23     1.5     6   16.0
7  3 HG    833    .490   13.52   1575   14.093   20956     124     1472    778    .113   14.0      166    87.9    88    3.0
8 16 HG    156    .150   13.68    140   13.846    8618      10      189     29    .077     .7       15     2.2     3   16.0
9 C.T.   24285   1.450    9.78     20   13.659    3765     669      807      2    .143   95.7      115      .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   8.2       31     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   8.0       31     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   8.1       31     6.7
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(    8.0) + 0.65(    8.1) =    8.093   GM/BHP HR
                                  CO- NDIR 0.35(   31.3) + 0.65(   30.6) =   30.831   GM/BHP HR
                                  NO2-CL   0.35(    6.5) + 0.65(    6.7) =    6.591   GM/BHP HR
                                                     CORRECTED NO2 =    7.119   GM/BHP HR
                                                              BSFC =    1.128   LB/BHP HR
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                         TABLE F-28 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP  TEST 64  RUN 5   EGR VALVE 2-1 63 JETS 08-13-73       K =1.061      HUM = 97.5  GR/LB
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           CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR         WT.       WEIGHTED GM/HR              MAN.
MODE        HC      CO     CO2     NO    CARBON   CONS.      HC      CO    NO2    FACT.      HC      CO     NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE       261    .780   12.37    115   13.432    3629      76     426     10    .232    17.7      99     2.4     0   19.3
2 16 HG       65   1.680   13.21    178   14.960    9299      44    2109     37    .077     3.4     162     2.8    13   16.0
3 10 HG       46    .560   13.62    410   14.230   14062      49    1118    135    .147     7.2     164    19.8    43   10.0
4 16 HG       51   1.880   13.12    205   15.055    9299      34    2346     42    .077     2.6     181     3.2    13   16.0
5 19 HG       44   1.450   13.30    157   14.798    6668      21    1320     23    .057     1.2      75     1.3     0   19.0
6 16 HG       49   1.820   13.11    235   14.983    9299      33    2282     48    .077     2.5     176     3.7    13   16.0
7  3 HG       72   1.730   13.02   1856   14.828   21864     115    5153    909    .113    13.0     582   102.7    92    3.0
8 16 HG       50   2.160   12.97    250   15.184    9299      33    2672     51    .077     2.5     206     3.9    13   16.0
9 C.T.      1709   2.290    9.33     99   13.460    3720     509    1251      9    .143    72.7     179     1.3     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.9      87     6.8
1 IDLE       261    .780   12.37    115   13.432    3629      76     426     10    .232    17.7      99     2.4     0   19.3
2 16 HG       59   2.170   12.95    188   15.184    9299      39    2685     38    .077     3.0     207     2.9    13   16.0
3 10 HG       40    .850   13.53    473   14.423   14062      42    1674    153    .147     6.2     246    22.5    43   10.0
4 16 HG       48   2.070   13.00    198   15.122    9299      32    2571     40    .077     2.5     198     3.1    13   16.0
5 19 HG       44   1.660   13.21    149   14.918    6668      21    1499     22    .057     1.2      85     1.3     0   19.0
6 16 HG       46   2.290   12.89    200   15.230    9299      30    2824     41    .077     2.3     217     3.1    13   16.0
7  3 HG       61   1.710   13.07   1796   14.846   21864      97    5087    878    .113    11.0     575    99.2    92    3.0
8 16 HG       55   2.250   12.92    258   15.229    9299      36    2775     52    .077     2.8     214     4.0    13   16.0
9 C.T.      1619   2.500    9.47    100   13.713    3720     473    1370      9    .143    67.6     196     1.3     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.5      98     6.7
1 IDLE       130   1.640   12.38    137   14.160    3629      36     849     12    .232     8.3     197     2.7     0   19.3
2 16 HG       57   2.250   12.89    186   15.202    9299      38    2780     38    .077     2.9     214     2.9    13   16.0
3 10 HG       47    .830   13.55    473   14.431   14062      49    1634    153    .147     7.3     240    22.5    43   10.0
4 16 HG       50   1.930   13.08    221   15.064    9299      33    2407     45    .077     2.6     185     3.5    13   16.0
5 19 HG       46   1.740   13.13    157   14.920    6668      22    1571     23    .057     1.3      90     1.3     0   19.0
6 16 HG       44   2.120   12.93    231   15.098    9299      29    2638     47    .077     2.3     203     3.6    13   16.0
7  3 HG       58   1.650   13.08   1853   14.793   21864      93    4926    909    .113    10.5     557   102.7    92    3.0
8 16 HG       41   2.060   12.99    224   15.094    9299      27    2564     46    .077     2.1     197     3.5    13   16.0
9 C.T.      1629   2.530    9.44    117   13.729    3720     477    1385     11    .143    68.2     198     1.5     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.0     100     6.9
1 IDLE       130   1.640   12.38    137   14.160    3629      36     849     12    .232     8.3     197     2.7     0   19.3
2 16 HG       55   2.070   12.95    208   15.079    9299      37    2579     43    .077     2.8     199     3.3    13   16.0
3 10 HG       34    .780   13.51    485   14.327   14062      36    1546    158    .147     5.3     227    23.2    43   10.0
4 16 HG       41   2.230   12.90    250   15.174    9299      27    2760     51    .077     2.1     213     3.9    13   16.0
5 19 HG       36   1.900   13.04    172   14.979    6668      17    1709     25    .057     1.0      97     1.4     0   19.0
6 16 HG       46   1.150   12.93    216   14.130    9299      33    1529     47    .077     2.5     118     3.6    13   16.0
7  3 HG       62   1.490   13.13   1902   14.687   21864     100    4481    940    .113    11.3     506   106.2    92    3.0
8 16 HG       52   2.270   12.87    230   15.196    9299      34    2806     47    .077     2.6     216     3.6    13   16.0
9 C.T.      1697   2.450    9.37    132   13.653    3720     499    1348     12    .143    71.4     193     1.7     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     5.1      94     7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     5.7      92     6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     5.1      97     7.0
FOUR CYCLE COMPOSITE -
                                        HC- NDIR 0.35(      5.7) + 0.65(      5.1) =     5.299   GM/BHP HR
                                        CO- NDIR 0.35(     92.5) + 0.65(     96.9) =    95.372   GM/BHP HR
                                        NO2-NDIR 0.35(      6.7) + 0.65(      7.0) =     6.935   GM/BHP HR
                                                                 CORRECTED NO2 =     7.355   GM/BHP HR
                                                                          BSFC =      .967   LB/BHP HR
```

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           CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR         WT.       WEIGHTED GM/HR              MAN.
MODE      HC-FID     CO     CO2  NO-CL    CARBON   CONS.      HC      CO    NO2    FACT.  HC-FID      CO  NO2-CL    HP    VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE      4206    .780   12.37     50   13.571    3629     112     421      4    .232    26.1      98     1.0     0   19.3
2 16 HG     1180   1.680   13.21    105   15.008    9299      73    2103     22    .077     5.6     162     1.7    13   16.0
3 10 HG      551    .560   13.62    330   14.235   14062      54    1117    108    .147     8.0     164    15.9    43   10.0
4 16 HG     1167   1.880   13.12    125   15.117    9299      72    2336     26    .077     5.5     180     2.0    13   16.0
5 19 HG      810   1.450   13.30     85   14.831    6668      36    1317     13    .057     2.1      75      .7     0   19.0
6 16 HG     1252   1.820   13.11    115   15.055    9299      77    2271     24    .077     6.0     175     1.8    13   16.0
7  3 HG     1619   1.730   13.02   1700   14.912   21864     237    5124    828    .113    26.8     579    93.5    92    3.0
8 16 HG     1368   2.160   12.97    175   15.267    9299      83    2658     35    .077     6.4     205     2.7    13   16.0
9 C.T.     27023   2.290    9.33     30   14.322    3720     702    1175      3    .143   100.4     168      .4     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.0      86     5.7
1 IDLE      4206    .780   12.37     50   13.571    3629     112     421      4    .232    26.1      98     1.0     0   19.3
2 16 HG     1453   2.170   12.95    115   15.265    9299      89    2670     23    .077     6.8     206     1.8    13   16.0
3 10 HG      821    .850   13.53    405   14.462   14062      80    1669    131    .147    11.7     245    19.2    43   10.0
4 16 HG     1310   2.070   13.00    130   15.201    9299      80    2558     26    .077     6.2     197     2.0    13   16.0
5 19 HG      938   1.660   13.21     90   14.964    6668      42    1494     13    .057     2.4      85      .8     0   19.0
6 16 HG     1412   2.290   12.89    125   15.321    9299      86    2808     25    .077     6.6     216     1.9    13   16.0
7  3 HG     1563   1.710   13.07   1700   14.936   21864     229    5056    826    .113    25.9     571    93.4    92    3.0
8 16 HG     1439   2.250   12.92    195   15.314    9299      87    2760     39    .077     6.7     213     3.0    13   16.0
9 C.T.     26213   2.500    9.47     25   14.591    3720     668    1287      2    .143    95.6     184      .3     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.0      97     5.9
1 IDLE      2711   1.640   12.38     55   14.291    3629      69     841      5    .232    16.0     195     1.1     0   19.3
2 16 HG     1539   2.250   12.89    120   15.294    9299      94    2763     24    .077     7.2     213     1.9    13   16.0
3 10 HG      864    .830   13.55    395   14.466   14062      84    1630    127    .147    12.4     240    18.7    43   10.0
4 16 HG     1281   1.930   13.08    155   15.138    9299      79    2395     32    .077     6.1     184     2.4    13   16.0
5 19 HG     1052   1.740   13.13     90   14.975    6668      47    1565     13    .057     2.7      89      .8     0   19.0
6 16 HG     1410   2.120   12.93    165   15.191    9299      86    2621     32    .077     6.6     202     2.4    13   16.0
7  3 HG     1548   1.650   13.08   1737   14.885   21864     227    4896    847    .113    25.7     553    95.7    92    3.0
8 16 HG     1339   2.060   12.99    140   15.184    9299      82    2548     28    .077     6.3     196     2.2    13   16.0
9 C.T.     26213   2.530    9.44     25   14.591    3720     668    1303      2    .143    95.6     186      .3     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     8.5      99     6.0
1 IDLE      2711   1.640   12.38     55   14.291    3629      69     841      5    .232    16.0     195     1.1     0   19.3
2 16 HG     1452   2.070   12.95    115   15.165    9299      89    2564     23    .077     6.9     197     1.8    13   16.0
3 10 HG      736    .780   13.51    390   14.364   14062      72    1543    127    .147    10.6     227    18.6    43   10.0
4 16 HG     1525   2.230   12.90    155   15.283    9299      93    2741     31    .077     7.1     211     2.4    13   16.0
5 19 HG     1138   1.900   13.04     85   15.054    6668      50    1700     12    .057     2.9      97      .7     0   19.0
6 16 HG     1441   1.150   12.93    120   14.224    9299      94    1519     26    .077     7.3     117     2.0    13   16.0
7  3 HG     1519   1.490   13.13   1800   14.772   21864     225    4455    885    .113    25.4     503    99.9    92    3.0
8 16 HG     1468   2.270   12.87    140   15.287    9299      89    2789     28    .077     6.9     215     2.2    13   16.0
9 C.T.     27068   2.450    9.37     25   14.527    3720     693    1267      2    .143    99.1     181      .3     0   22.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     8.7      93     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     9.0      92     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     8.6      96     6.1
FOUR CYCLE COMPOSITE -
                                        HC- FID  0.35(      9.0) + 0.65(      8.6) =     8.756   GM/BHP HR
                                        CO- NDIR 0.35(     91.5) + 0.65(     95.9) =    94.340   GM/BHP HR
                                        NO2-CL   0.35(      5.8) + 0.65(      6.1) =     6.002   GM/BHP HR
                                                                 CORRECTED NO2 =     6.366   GM/BHP HR
                                                                          BSFC =      .967   LB/BHP HR
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                         TABLE F.29 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP TEST-69    RUN-X   SIMULATED EGR-63 JETS 07-25-73        K =1.079      HUM =106.8  GR/LB
------------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR                   MAN.
MODE             HC       CO     CO2     NO    CARBON    CONS.      HC      CO     NO2    FACT.     HC       CO     NO2     HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          112    1.840   12.81    134    14.771     3583      29     902     11     .232     6.8      209     2.5      0     19.5
2 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
3 10 MG          42    1.310   13.29    385    14.695    13517      42    2442    118     .147     6.2      359    17.3     40     10.0
4 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
5 19 MG          33     .340   14.20    164    14.576     7258      18     342     27     .057     1.0       19     1.5      0     19.0
6 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5      0     19.0
7  3 MG          51    1.570   13.00   1351    14.625    21228      80    4603    651     .113     9.0      520    73.6     11     16.0
8 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     86      3.0
9 C.T.         2135    2.900    9.23    131    13.936     3674     608    1278     11     .143    86.9      183     1.6      2     16.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.3      108     5.8      0     22.0
1 IDLE          112    1.840   12.81    134    14.771     3583      29     902     11     .232     6.8      209     2.5      0     19.5
2 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
3 10 MG          42    1.310   13.29    385    14.695    13517      42    2442    118     .147     6.2      359    17.3     40     10.0
4 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
5 19 MG          33     .340   14.20    164    14.576     7258      18     342     27     .057     1.0       19     1.5      0     19.0
6 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
7  3 MG          51    1.570   13.00   1351    14.625    21228      80    4603    651     .113     9.0      520    73.6     86      3.0
8 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5      2     16.0
9 C.T.         2135    2.900    9.23    131    13.936     3674     608    1278     11     .143    86.9      183     1.6      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.3      108     5.8
1 IDLE          112    1.840   12.81    134    14.771     3583      29     902     11     .232     6.8      209     2.5      0     19.5
2 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
3 10 MG          42    1.310   13.29    385    14.695    13517      42    2442    118     .147     6.2      359    17.3     40     10.0
4 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
5 19 MG          33     .340   14.20    164    14.576     7258      18     342     27     .057     1.0       19     1.5      0     19.0
6 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
7  3 MG          51    1.570   13.00   1351    14.625    21228      80    4603    651     .113     9.0      520    73.6     86      3.0
8 16 MG          33    1.830   13.14    160    15.056     9072      21    2227     32     .077     1.7      172     2.5      2     16.0
9 C.T.         2135    2.900    9.23    131    13.936     3674     608    1278     11     .143    86.9      183     1.6      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.3      108     5.8
1 IDLE          112    1.840   12.81    134    14.771     3583      29     902     11     .232     6.8      209     2.5      0     19.5
2 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
3 10 MG          42    1.310   13.29    385    14.695    13517      42    2442    118     .147     6.2      359    17.3     40     10.0
4 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
5 19 MG          33    1.830   14.20    164    16.066     7258      16    1670     25     .057      .9       95     1.4      0     19.0
6 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5     11     16.0
7  3 MG          51    1.570   13.00   1351    14.625    21228      80    4603    651     .113     9.0      520    73.6     86      3.0
8 16 MG          33    1.830   13.14    160    15.006     9072      22    2235     32     .077     1.7      172     2.5      2     16.0
9 C.T.         2135    2.900    9.23    131    13.936     3674     608    1278     11     .143    86.9      183     1.6      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     6.3      112     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     6.3      108     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     6.3      110     5.8
FOUR CYCLE COMPOSITE -
                                       HC- NDIR 0.35(      6.3) + 0.65(      6.3) =     6.344   GM/BHP HR
                                       CO- NDIR 0.35(    107.7) + 0.65(    109.8) =   109.057   GM/BHP HR
                                       NO2-NDIR 0.35(      5.8) + 0.65(      5.8) =     5.794   GM/BHP HR
                                                                 CORRECTED NO2 =     6.253   GM/BHP HR
                                                                          BSFC =     1.074   LB/BHP HR


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              CONCENTRATION AS MEASURED      TOTAL     FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR                   MAN.
MODE          HC-FID     CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.   HC-FID     CO    NO2-CL   HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE         3577    1.840   12.81     58    15.008     3583      85     887      5     .232    19.8      206     1.1      0     19.5
2 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
3 10 MG        1064    1.310   13.29    350    14.706    13517      98    2432    107     .147    14.4      358    15.7     40     10.0
4 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
5 19 MG         320     .340   14.20    296    14.572     7258      16     342     49     .057      .9       19     2.8      0     19.0
6 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
7  3 MG        1532    1.570   13.00   1350    14.723    21228     221    4573    646     .113    25.0      517    73.0     86      3.0
8 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7      2     16.0
9 C.T.        27856    2.900    9.23     40    14.916     3674     710    1236      3     .143   101.5      177      .5      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     10.0      107     5.4
1 IDLE         3577    1.840   12.81     58    15.008     3583      85     887      5     .232    19.8      206     1.1      0     19.5
2 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
3 10 MG        1064    1.310   13.29    350    14.706    13517      98    2432    107     .147    14.4      358    15.7     40     10.0
4 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
5 19 MG         320     .340   14.20    296    14.572     7258      16     342     49     .057      .9       19     2.8      0     19.0
6 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
7  3 MG        1532    1.570   13.00   1350    14.723    21228     221    4573    646     .113    25.0      517    73.0     86      3.0
8 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7      2     16.0
9 C.T.        27856    2.900    9.23     40    14.916     3674     710    1236      3     .143   101.5      177      .5      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     10.0      107     5.4
1 IDLE         3577    1.840   12.81     58    15.008     3583      85     887      5     .232    19.8      206     1.1      0     19.5
2 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
3 10 MG        1064    1.310   13.29    350    14.706    13517      98    2432    107     .147    14.4      358    15.7     40     10.0
4 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
5 19 MG         320     .340   14.20    296    14.572     7258      16     342     49     .057      .9       19     2.8      0     19.0
6 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
7  3 MG        1532    1.570   13.00   1350    14.723    21228     221    4573    646     .113    25.0      517    73.0     86      3.0
8 16 MG        1196    1.830   13.14    113    15.140     9072      72    2215     22     .077     5.5      171     1.7      2     16.0
9 C.T.        27856    2.900    9.23     40    14.916     3674     710    1236      3     .143   101.5      177      .5      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     10.0      107     5.4
1 IDLE         3577    1.840   12.81     58    15.008     3583      85     887      5     .232    19.8      206     1.1      0     19.5
2 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
3 10 MG        1064    1.310   13.29    350    14.706    13517      98    2432    107     .147    14.4      358    15.7     40     10.0
4 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
5 19 MG         324    1.830   14.20    296    16.062     7258      15    1670     44     .057      .8       95     2.5      0     19.0
6 16 MG        1195    1.830   13.14    113    15.090     9072      72    2222     23     .077     5.5      171     1.7     11     16.0
7  3 MG        1532    1.570   13.00   1350    14.723    21228     221    4573    646     .113    25.0      517    73.0     86      3.0
8 16 MG        1195    1.830   13.14    1:3    15.090     9072      72    2222     23     .077     5.5      171     1.7      2     16.0
9 C.T.        27856    2.900    9.23     40    14.916     3674     710    1236      3     .143   101.5      177      .5      0     22.0
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     10.0      111     5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     10.0      107     5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     10.0      109     5.4
FOUR CYCLE COMPOSITE -
                                      HC- FID  0.35(     10.0) + 0.65(     10.0) =     9.999   GM/BHP HR
                                      CO- NDIR 0.35(    106.7) + 0.65(    108.8) =   108.068   GM/BHP HR
                                      NO2-CL   0.35(      5.4) + 0.65(      5.4) =     5.440   GM/BHP HR
                                                                CORRECTED NO2 =     5.870   GM/BHP HR
                                                                         BSFC =     1.074   LB/BHP HR
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                   TABLE F-30 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP TEST-74 RUN-1 0 CAT-AIR-EGR 10PCT 63JETS 8-20-73      K =1.077     HUM =105.8  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE           HC      CO    CO2     NO    CARBON   CONS.      HC      CO     NO2    FACT.   HC        CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         57    .040  10.33     73   10.432    3402       20      26       8    .232    4.7        6    1.8     0    15.5
2 16 MG        49    .070  12.18    110   12.303    9208       40     106      27    .077    3.0        8    2.1     8    16.0
3 10 MG        42    .070  12.72    235   12.835   12792       45     141      78    .147    6.6       21   11.4    34    10.0
4 16 MG        46    .060  12.05    129   12.160    9208       38      92      32    .077    2.9        7    2.5     8    16.0
5 19 MG        39    .060  11.28    110   11.382    6260       23      67      20    .057    1.3        4    1.1     0    19.0
6 16 MG        46    .060  12.05    128   12.160    9208       38      92      32    .077    2.9        7    2.5     8    16.0
7  3 MG        41    .060  14.03   1410   14.134   21138       66     181     700    .113    7.5       20   79.1    87     3.0
8 16 MG        25    .060  12.31    135   12.347    9208       20      90      33    .077    1.5        7    2.6     8    16.0
9 C.T.         31    .060   9.02     24    9.113    2812       10      37       2    .143    1.5        5     .4     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.9        5    6.0
1 IDLE         57    .040  10.33     73   10.432    3402       20      26       8    .232    4.7        6    1.8     0    15.0
2 16 MG        28    .060  12.16    121   12.250    9208       23      91      30    .077    1.8        7    2.3     8    16.0
3 10 MG        20    .060  13.14    250   13.222   12792       21     117      80    .147    3.1       17   11.8    34    10.0
4 16 MG        32    .060  12.02    107   12.115    9208       26      92      27    .077    2.0        7    2.1     8    16.0
5 19 MG        56    .060  11.53     97   11.650    6260       32      65      17    .057    1.9        4    1.0     0    19.0
6 16 MG        37    .060  12.31    135   12.410    9208       30      90      33    .077    2.3        7    2.6     8    16.0
7  3 MG        23    .060  14.18   1350   14.265   21138       37     180     664    .113    4.2       20   75.0    87     3.0
8 16 MG        19    .060  12.59    135   12.671    9208       15      88      33    .077    1.1        7    2.5     8    16.0
9 C.T.         20    .060   9.02     48    9.102    2812        7      37       5    .143    1.0        5     .7     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.3        5    5.8
1 IDLE         23    .040  11.28     48   11.345    3402        7      24       5    .232    1.7        6    1.1     0    15.5
2 16 MG        37    .060  12.31    122   12.410    9208       30      90      30    .077    2.3        7    2.3     8    16.0
3 10 MG        28    .060  12.86    290   12.950   12792       30     120      95    .147    4.4       18   14.0    34    10.0
4 16 MG        28    .060  12.31     98   12.400    9208       22      90      24    .077    1.7        7    1.9     8    16.0
5 19 MG        23    .060  11.41    122   11.495    6260       14      66      22    .057     .8        4    1.3     0    19.0
6 16 MG        28    .060  12.41    135   12.500    9208       22      89      33    .077    1.7        7    2.5     8    16.0
7  3 MG        23    .040  14.03   1505   14.095   21138       37     121     749    .113    4.8       14   84.7    87     3.0
8 16 MG        23    .040  12.45    135   12.515    9208       18      59      33    .077    1.4        5    2.5     8    16.0
9 C.T.         23    .040   9.02     48    9.085    2812        8      25       5    .143    1.1        4     .7     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.1        4    6.4
1 IDLE         23    .040  11.28     48   11.345    3402        7      24       5    .232    1.7        6    1.1     0    15.0
2 16 MG        27    .040  12.05    110   12.119    9208       22      61      28    .077    1.7        5    2.1     8    16.0
3 10 MG        23    .040  12.72    277   12.785   12792       25      81      92    .147    3.7       12   13.5    34    10.0
4 16 MG        37    .040  12.05    122   12.130    9208       30      61      31    .077    2.3        5    2.4     8    16.0
5 19 MG        28    .040  11.28     73   11.350    6260       17      45      13    .057    1.0        3     .8     0    19.0
6 16 MG        37    .040  12.05     98   12.130    9208       30      61      25    .077    2.3        5    1.9     8    16.0
7  3 MG        42    .060  13.88   1485   13.985   21138       69     183     745    .113    7.7       21   84.2    87     3.0
8 16 MG        42    .040  12.31    110   12.395    9208       34      60      27    .077    2.6        5    2.1     8    16.0
9 C.T.         33    .040   9.02     48    9.096    2812       11      25      10    .143    1.6        4    1.4     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.4        4    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------    1.6        5    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------    1.3        4    6.4
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     1.6) + 0.65(     1.3) =     1.378   GM/BHP HR
                                         CO- NDIR 0.35(     4.8) + 0.65(     3.9) =     4.195   GM/BHP HR
                                         NO2-NDIR 0.35(     5.9) + 0.65(     6.4) =     6.231   GM/BHP HR
                                                           CORRECTED NO2 =     6.719   GM/BHP HR
                                                                    BSFC =     1.108   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID   CO    CO2   NO-CL   CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL  HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         42    .040  10.33     58   10.374    3402        1      26       6    .232     .3        6    1.5     0    15.5
2 16 MG        18    .070  12.18     90   12.252    9208        1     106      22    .077     .1        8    1.7     8    16.0
3 10 MG        21    .070  12.72    230   12.792   12792        2     141      76    .147     .3       21   11.2    34    10.0
4 16 MG        19    .060  12.05    106   12.112    9208        1      92      27    .077     .1        7    2.1     8    16.0
5 19 MG        14    .060  11.28     75   11.342    6260        1      67      14    .057     .1        4     .8     0    19.0
6 16 MG        19    .060  12.05    103   12.112    9208        1      92      26    .077     .1        7    2.0     8    16.0
7  3 MG        32    .060  14.03   1375   14.093   21138        5     182     685    .113     .5       21   77.4    87     3.0
8 16 MG        19    .060  12.31    135   12.372    9208        1      90      33    .077     .1        7    2.6     8    16.0
9 C.T.         62    .060   9.02     17    9.086    2812        2      38       2    .143     .3        5     .2     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .1        5    5.8
1 IDLE         42    .040  10.33     58   10.374    3402        1      26       6    .232     .3        6    1.5     0    15.0
2 16 MG        18    .060  12.16     95   12.222    9208        1      91      24    .077     .1        7    1.8     8    16.0
3 10 MG        16    .060  13.14    212   13.202   12792        2     117      68    .147     .2       17   10.0    34    10.0
4 16 MG        14    .060  12.02    105   12.081    9208        1      92      27    .077     .1        7    2.0     8    16.0
5 19 MG        14    .060  11.53     78   11.591    6260        1      65      14    .057     .0        4     .8     0    19.0
6 16 MG        14    .060  12.31    105   12.371    9208        1      90      26    .077     .1        7    2.0     8    16.0
7  3 MG        23    .060  14.18   1313   14.242   21138        3     180     647    .113     .4       20   73.1    87     3.0
8 16 MG        15    .060  12.59    115   12.651    9208        1      88      28    .077     .1        7    2.1     8    16.0
9 C.T.         51    .060   9.02     17    9.085    2812        2      38       2    .143     .2        5     .2     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .1        5    6.4
1 IDLE         14    .040  11.28     41   11.321    3402        0      24       4    .232     .1        6     .9     0    15.5
2 16 MG        14    .060  12.31     93   12.371    9208        1      90      23    .077     .1        7    1.8     8    16.0
3 10 MG        15    .060  12.86    270   12.921   12792        1     120      89    .147     .2       18   13.0    34    10.0
4 16 MG        12    .060  12.31    110   12.371    9208        1      90      27    .077     .1        7    2.1     8    16.0
5 19 MG        12    .060  11.41     85   11.471    6260        1      66      15    .057     .0        4     .9     0    19.0
6 16 MG        12    .060  12.41    110   12.471    9208        1      89      27    .077     .1        7    2.1     8    16.0
7  3 MG        19    .040  14.03   1500   14.072   21138        3     121     748    .113     .3       14   84.5    87     3.0
8 16 MG        10    .040  12.45    125   12.491    9208        1      60      31    .077     .1        5    2.4     8    16.0
9 C.T.         41    .040   9.02     17    9.064    2812        1      25       2    .143     .2        4     .3     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .1        4    6.3
1 IDLE         14    .040  11.28     41   11.321    3402        0      24       4    .232     .1        6     .9     0    15.0
2 16 MG        10    .040  12.05    110   12.091    9208        1      62      28    .077     .1        5    2.1     8    16.0
3 10 MG        10    .040  12.72    270   12.761   12792        1      81      90    .147     .1       12   13.2    34    10.0
4 16 MG        10    .040  12.05    115   12.091    9208        1      62      29    .077     .1        5    2.2     8    16.0
5 19 MG        10    .040  11.28    105   11.321    6260        1      45      19    .057     .0        3    1.1     0    19.0
6 16 MG        10    .040  12.05    115   12.091    9208        1      62      29    .077     .1        5    2.2     8    16.0
7  3 MG        18    .060  13.88   1500   13.942   21138        3     184     755    .113     .3       21   85.3    87     3.0
8 16 MG        10    .040  12.31    125   12.351    9208        1      60      31    .077     .1        5    2.4     8    16.0
9 C.T.         62    .040   9.02     16    9.066    2812        2      25       2    .143     .3        4     .2     0    22.3
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     .1        4    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     .1        5    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     .1        4    6.3
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(      .1) + 0.65(      .1) =      .078   GM/BHP HR
                                         CO- NDIR 0.35(     4.8) + 0.65(     3.9) =     4.206   GM/BHP HR
                                         NO2-CL   0.35(     5.6) + 0.65(     6.3) =     6.075   GM/BHP HR
                                                           CORRECTED NO2 =     6.545   GM/BHP HR
                                                                    BSFC =     1.108   LB/BHP HR
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                    TABLE F-3; MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP TEST-74 RUN-2 0 CAT-AIR-EGR 10PCT 63JETS 8-20-73     K =1.075     HUM =104.3  GR/LB
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             CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR         MAN.
MODE          HC     CO    CO2     NO     CARBON   CONS.      HC      CO    NO2    FACT.   HC      CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        34   .070  10.57     75     10.682    3402      13      45      8    .232    3.1     10    1.8     0   15.5
2 16 MG       34   .080  12.34    134     12.462    9208      31     119     33    .077    2.4      9    2.5     8   16.0
3 10 MG       23   .070  12.89    290     12.985   12792      24     139     95    .147    3.6     20   13.9    34   10.0
4 16 MG       38   .080  12.09    153     12.211    9208      31     122     38    .077    2.4      9    2.9     8   16.0
5 19 MG       39   .080  11.13    121     11.252    6260      23      90     22    .057    1.3      5    1.3     0   19.0
6 16 MG       37   .070  12.11    156     12.220    9208      30     107     39    .077    2.3      8    3.0     8   16.0
7  3 MG       30   .090  14.43   1721     14.552   21138      47     264    830    .113    5.3     30   93.8    87    3.0
8 16 MG       31   .070  11.42    127     11.523    9208      27     113     34    .077    2.1      9    2.6     8   16.0
9 C.T.        37   .070   9.01     51      9.120    2812      12      44      5    .143    1.8      6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.4      6    7.1
1 IDLE        39   .070  10.57     75     10.682    3402      13      45      8    .232    3.1     10    1.8     0   15.0
2 16 MG       30   .080  12.34    146     12.452    9208      24     119     36    .077    1.8      9    2.8     8   16.0
3 10 MG       39   .080  13.14    292     13.262   12792      41     156     94    .147    6.0     23   13.7    34   10.0
4 16 MG       34   .070  12.45    148     12.557    9208      27     104     36    .077    2.1      8    2.8     8   16.0
5 19 MG       31   .080  11.44    121     11.553    6260      18      88     22    .057    1.0      5    1.2     0   19.0
6 16 MG       35   .080  12.45    149     12.568    9208      28     118     36    .077    2.1      9    2.8     8   16.0
7  3 MG       33   .090  14.51   1610     14.636   21138      51     263    772    .113    5.8     30   87.2    87    3.0
8 16 MG       30   .080  12.71    152     12.822    9208      23     116     36    .077    1.8      9    2.8     8   16.0
9 C.T.        22   .070   9.18     52      9.274    2812       7      43      5    .143    1.0      6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.4      6    6.7
1 IDLE        19   .070  11.46     72     11.551    3402       6      42      7    .232    1.4     10    1.6     0   15.5
2 16 MG       32   .110  12.48    139     12.625    9208      25     162     34    .077    1.9     12    2.6     8   16.0
3 10 MG       26   .060  13.16    290     13.248   12792      27     117     93    .147    4.0     17   13.7    34   10.0
4 16 MG       25   .070  12.54    141     12.637    9208      20     103     34    .077    1.5      8    2.6     8   16.0
5 19 MG       28   .070  11.47    112     11.570    6260      16      77     20    .057     .9      4    1.1     0   19.0
6 16 MG       35   .070  12.71    137     12.818    9208      27     102     33    .077    2.1      8    2.5     8   16.0
7  3 MG       58   .110  14.66   1382     14.833   21138      89     317    654    .113   10.1     36   73.9    87    3.0
8 16 MG       53   .070  12.75    143     12.877    9208      41     101     34    .077    3.2      8    2.6     8   16.0
9 C.T.        49   .070   9.00     47      9.123    2812      16      44      5    .143    2.3      6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.6      6    5.9
1 IDLE        19   .070  11.46     72     11.551    3402       6      42      7    .232    1.4     10    1.6     0   15.5
2 16 MG       27   .080  12.70    130     12.809    9208      21     116     31    .077    1.6      9    2.4     8   16.0
3 10 MG       26   .070  13.24    272     13.338   12792      27     136     87    .147    4.0     20   12.7    34   10.0
4 16 MG       21   .060  12.44    148     12.573    9208      17      89     36    .077    1.3      7    2.8     8   16.0
5 19 MG       22   .070  11.49    106     11.584    6260      13      76     19    .057     .7      4    1.1     0   19.0
6 16 MG       20   .080  12.44    147     12.592    9208      16     118     36    .077    1.2      9    2.7     8   16.0
7  3 MG       23   .080  14.50   1614     14.605   21138      36     234    776    .113    4.1     26   87.6    87    3.0
8 16 MG       24   .070  12.73    143     12.831    9208      22     101     34    .077    1.7      8    2.6     8   16.0
9 C.T.        24   .070   6.72     47      8.816    2812       8      45      5    .143    1.2      6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    1.0      5    6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    1.4      6    6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    1.3      6    6.3
FOUR CYCLE COMPOSITE -               HC- NDIR 0.35(     1.4) + 0.65(     1.3) =    1.342   GM/BHP HR
                                     CO- NDIR 0.35(     6.3) + 0.65(     6.1) =    6.148   GM/BHP HR
                                     NO2-NDIR 0.35(     6.9) + 0.65(     6.3) =    6.499   GM/BHP HR
                                                             CORRECTED NO2 =    6.983   GM/BHP HR
                                                                      BSFC =    1.108   LB/BHP HR
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             CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR         MAN.
MODE        HC-FID   CO    CO2   NO-CL    CARBON   CONS.      HC      CO    NO2    FACT.  HC-FID    CO  NO2-CL   HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        25   .070  10.57     45     10.643    3402       1      45      5    .232     .2     10    1.1     0   15.5
2 16 MG        7   .080  12.34    100     12.421    9208       0     120     25    .077     .0      9    1.9     8   16.0
3 10 MG        7   .070  12.89    248     12.961   12792       1     140     81    .147     .1     21   11.9    34   10.0
4 16 MG        6   .080  12.09    113     12.171    9208       0     122     28    .077     .0      9    2.2     8   16.0
5 19 MG        6   .080  11.13     80     11.211    6260       0      90     15    .057     .0      5     .8     0   19.0
6 16 MG        6   .070  12.11    118     12.181    9208       0     107     30    .077     .0      8    2.3     8   16.0
7  3 MG       15   .090  14.43   1675     14.521   21138       2     265    809    .113     .2     30   91.5    87    3.0
8 16 MG        3   .070  11.42     90     11.490    9208       0     113     24    .077     .0      9    1.8     8   16.0
9 C.T.        44   .070   9.01     21      9.085    2812       1      44      2    .143     .2      6     .3     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .1      6    6.6
1 IDLE        25   .070  10.57     45     10.643    3402       1      45      5    .232     .2     10    1.1     0   15.0
2 16 MG        7   .080  12.34    110     12.421    9208       0     120     27    .077     .0      9    2.1     8   16.0
3 10 MG        3   .080  13.14    283     13.220   12792       0     156     91    .147     .0     23   13.4    34   10.0
4 16 MG        3   .070  12.45    110     12.520    9208       0     104     27    .077     .0      8    2.1     8   16.0
5 19 MG        3   .080  11.44     83     11.520    6260       0      88     15    .057     .0      5     .9     0   19.0
6 16 MG        3   .080  12.45    120     12.530    9208       0     119     29    .077     .0      9    2.3     8   16.0
7  3 MG       10   .090  14.51   1575     14.601   21138       1     263    757    .113     .2     30   85.5    87    3.0
8 16 MG        3   .080  12.71    120     12.790    9208       0     116     29    .077     .0      9    2.2     8   16.0
9 C.T.        41   .070   9.18     23      9.254    2812       1      43      2    .143     .2      6     .3     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .0      6    6.4
1 IDLE         7   .070  11.46     45     11.531    3402       0      92      4    .232     .0     10    1.0     0   15.5
2 16 MG        4   .110  12.48    100     12.590    9208       0     163     24    .077     .0     13    1.9     8   16.0
3 10 MG        3   .060  13.16    260     13.220   12792       0     117     84    .147     .0     17   12.3    34   10.0
4 16 MG        2   .070  12.54    110     12.610    9208       0     103     27    .077     .0      8    2.1     8   16.0
5 19 MG        2   .070  11.47     75     11.540    6260       0      77     14    .057     .0      4     .8     0   19.0
6 16 MG        2   .070  12.71    105     12.780    9208       0     102     25    .077     .0      8    1.9     8   16.0
7  3 MG        2   .110  14.66   1350     14.770   21138       0     318    641    .113     .0     36   72.5    87    3.0
8 16 MG        2   .070  12.75    110     12.820    9208       0     102     26    .077     .0      8    2.0     8   16.0
9 C.T.        37   .070   9.00     24      9.074    2812       1      44      2    .143     .2      6     .4     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .0      6    5.5
1 IDLE         7   .070  11.46     45     11.531    3402       0      92      4    .232     .0     10    1.0     0   15.5
2 16 MG        2   .080  12.70     40     12.780    9208       0     116     22    .077     .0      9    1.7     8   16.0
3 10 MG        2   .070  13.24    235     13.310   12792       0     136     75    .147     .0     20   11.0    34   10.0
4 16 MG        2   .060  12.44    110     12.550    9208       0      89     27    .077     .0      7    2.1     8   16.0
5 19 MG        2   .070  11.49     70     11.560    6260       0      77     13    .057     .0      4     .7     0   19.0
6 16 MG        2   .080  12.49    110     12.570    9208       0     118     27    .077     .0      9    2.1     8   16.0
7  3 MG        7   .080  14.50   1575     14.581   21138       1     234    758    .113     .1     26   85.7    87    3.0
8 16 MG        2   .070  12.73    110     12.800    9208       0     102     26    .077     .0      8    2.0     8   16.0
9 C.T.        37   .070   8.72     23      8.794    2812       1      45      2    .143     .2      6     .3     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     .0      6    6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .0      6    6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .0      6    5.8
FOUR CYCLE COMPOSITE -               HC- FID  0.35(      .0) + 0.65(      .0) =     .031   GM/BHP HR
                                     CO- NDIR 0.35(     6.3) + 0.65(     6.1) =    6.165   GM/BHP HR
                                     NO2-CL   0.35(     6.5) + 0.65(     5.8) =    6.076   GM/BHP HR
                                                             CORRECTED NO2 =    6.530   GM/BHP HR
                                                                      BSFC =    1.108   LB/BHP HR
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TABLE F-32 MASS EMISSIONS BY NINE-MODE FTP

ENGINE 6-UP TEST-76 RUN-1 0 CAT-AIR-EGR 10 PCT. 08-20-73 K =1.061 HUM = 97.9 GR/LB

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC	CO	CO2	NO	CARBON	CONS.	HC	CO	NO2	FACT.	HC	CO	NO2	HP	VAC.
1 IDLE	26	.100	10.32	99	10.448	3538	10	68	11	.232	2.2	16	2.6	0	15.2
2 16 HG	26	.100	11.11	139	11.238	8346	21	150	34	.077	1.6	12	2.6	4	16.0
3 10 HG	19	.090	11.64	248	11.751	12020	21	186	84	.147	3.1	27	12.4	28	10.0
4 16 HG	29	.090	10.89	147	11.011	8346	24	138	37	.077	1.8	11	2.8	4	16.0
5 19 HG	26	.090	10.44	124	10.558	6124	16	105	24	.057	.9	6	1.4	0	19.0
6 16 HG	26	.090	10.99	159	11.108	8346	21	137	40	.077	1.6	11	3.1	4	16.0
7 3 HG	30	.100	13.37	1782	13.502	21228	51	318	930	.113	5.8	36	105.1	85	3.0
8 16 HG	31	.080	11.03	169	11.143	8346	25	121	42	.077	1.9	9	3.2	4	16.0
9 C.T.	30	.090	8.61	75	8.732	3629	13	76	10	.143	1.9	11	1.5	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											1.4	9	9.1		
1 IDLE	26	.100	10.32	99	10.448	3538	10	68	11	.232	2.2	16	2.6	0	15.2
2 16 HG	24	.080	11.09	176	11.196	8346	19	120	44	.077	1.5	9	3.4	4	16.0
3 10 HG	20	.090	12.00	295	12.112	12020	21	180	97	.147	3.2	27	14.3	28	10.0
4 16 HG	24	.090	11.24	189	11.356	8346	19	134	46	.077	1.5	10	3.6	4	16.0
5 19 HG	23	.080	10.74	163	10.845	6124	14	91	31	.057	.8	5	1.7	0	19.0
6 16 HG	24	.080	11.17	190	11.276	8346	19	120	47	.077	1.5	9	3.6	4	16.0
7 3 HG	24	.080	13.39	1814	13.496	21228	41	254	947	.113	4.6	29	107.0	85	3.0
8 16 HG	32	.080	11.14	208	11.255	8346	26	120	51	.077	2.0	9	3.9	4	16.0
9 C.T.	26	.080	8.57	111	8.678	3629	12	68	15	.143	1.7	10	2.2	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											1.3	8	9.6		
1 IDLE	33	.090	10.80	163	10.926	3538	12	59	18	.232	2.7	14	4.1	0	15.2
2 16 HG	27	.090	11.18	207	11.299	8346	22	134	51	.077	1.7	10	3.9	4	16.0
3 10 HG	25	.080	11.68	297	11.787	12020	28	165	101	.147	4.0	24	14.8	28	10.0
4 16 HG	23	.080	11.06	208	11.165	8346	19	121	52	.077	1.4	9	4.0	4	16.0
5 19 HG	20	.090	10.56	193	10.672	6124	12	104	37	.057	.7	6	2.1	0	19.0
6 16 HG	25	.090	11.06	219	11.177	8346	20	136	54	.077	1.6	10	4.2	4	16.0
7 3 HG	31	.090	13.34	1855	13.463	21228	53	287	971	.113	6.0	32	109.7	85	3.0
8 16 HG	25	.090	11.10	229	11.217	8346	20	135	57	.077	1.5	10	4.4	4	16.0
9 C.T.	30	.090	8.65	138	8.772	3629	13	76	19	.143	1.9	11	2.7	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											1.4	9	10.1		
1 IDLE	33	.090	10.80	163	10.926	3538	12	59	18	.232	2.7	14	4.1	0	15.2
2 16 HG	25	.080	11.20	211	11.307	8346	20	119	52	.077	1.5	9	4.0	4	16.0
3 10 HG	10	.080	11.86	310	11.951	12020	11	163	104	.147	1.6	24	15.2	28	10.0
4 16 HG	26	.080	11.11	214	11.218	8346	21	120	53	.077	1.6	9	4.1	4	16.0
5 19 HG	13	.090	10.67	179	10.774	6124	8	103	34	.057	.5	6	1.9	0	19.0
6 16 HG	23	.080	11.07	209	11.175	8346	19	121	51	.077	1.4	9	3.9	4	16.0
7 3 HG	31	.090	13.28	1790	13.403	21228	53	288	941	.113	6.0	33	106.4	85	3.0
8 16 HG	26	.080	10.97	208	11.078	8346	21	122	52	.077	1.6	9	4.0	4	16.0
9 C.T.	16	.080	8.58	127	8.677	3629	7	68	18	.143	1.0	10	2.5	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											1.2	8	9.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------											1.3	9	9.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------											1.3	8	10.0		

FOUR CYCLE COMPOSITE -

```
HC- NDIR 0.35(   1.3) + 0.65(   1.3) =   1.331  GM/BHP HR
CO- NDIR 0.35(   8.8) + 0.65(   8.4) =   8.660  GM/BHP HR
NO2-NDIR 0.35(   9.3) + 0.65(  10.0) =   9.735  GM/BHP HR
                        CORRECTED NO2 =  10.333  GM/BHP HR
                                 BSFC =   1.250  LB/BHP HR
```

MODE	CONCENTRATION AS MEASURED				TOTAL	FUEL	CALCULATED GM/HR			WT.	WEIGHTED GM/HR				MAN.
	HC-FID	CO	CO2	NO-CL	CARBON	CONS.	HC	CO	NO2	FACT.	HC-FID	CO	NO2-CL	HP	VAC.
1 IDLE	34	.100	10.32	45	10.424	3538	1	69	5	.232	.3	16	1.2	0	15.2
2 16 HG	15	.100	11.11	90	11.212	8346	1	150	22	.077	.1	12	1.7	4	16.0
3 10 HG	18	.090	11.64	190	11.732	12020	2	186	65	.147	.3	27	9.6	28	10.0
4 16 HG	13	.090	10.89	90	10.981	8346	1	138	23	.077	.1	11	1.7	4	16.0
5 19 HG	13	.090	10.44	70	10.531	6124	1	106	14	.057	.0	6	.8	0	19.0
6 16 HG	13	.090	10.99	100	11.081	8346	1	137	25	.077	.1	11	1.9	4	16.0
7 3 HG	21	.100	13.37	1700	13.472	21228	3	318	889	.113	.4	36	100.5	85	3.0
8 16 HG	12	.080	11.03	120	11.111	8346	1	121	30	.077	.1	9	2.3	4	16.0
9 C.T.	78	.090	8.61	30	8.708	3629	3	76	4	.143	.5	11	.6	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											.1	9	8.1		
1 IDLE	34	.100	10.32	45	10.424	3538	1	69	5	.232	.3	16	1.2	0	15.2
2 16 HG	13	.080	11.09	90	11.171	8346	1	121	22	.077	.1	9	1.7	4	16.0
3 10 HG	13	.090	12.00	205	12.091	12020	1	181	68	.147	.2	27	9.9	28	10.0
4 16 HG	12	.090	11.24	100	11.331	8346	1	134	24	.077	.1	10	1.9	4	16.0
5 19 HG	12	.080	10.74	75	10.821	6124	1	91	14	.057	.0	5	.8	0	19.0
6 16 HG	12	.080	11.17	100	11.251	8346	1	120	25	.077	.1	9	1.9	4	16.0
7 3 HG	18	.080	13.39	1737	13.472	21228	3	255	909	.113	.3	29	102.7	85	3.0
8 16 HG	10	.080	11.14	110	11.221	8346	1	120	27	.077	.1	9	2.1	4	16.0
9 C.T.	67	.080	8.57	25	8.657	3629	3	68	3	.143	.4	10	.5	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											.1	8	8.3		
1 IDLE	15	.090	10.80	45	10.892	3538	1	59	5	.232	.1	14	1.1	0	15.2
2 16 HG	12	.090	11.18	90	11.271	8346	1	135	22	.077	.1	10	1.7	4	16.0
3 10 HG	13	.080	11.68	200	11.761	12020	1	165	68	.147	.2	24	10.0	28	10.0
4 16 HG	10	.080	11.06	100	11.141	8346	1	121	25	.077	.1	9	1.9	4	16.0
5 19 HG	10	.090	10.56	75	10.651	6124	1	103	14	.057	.0	6	.8	0	19.0
6 16 HG	10	.090	11.06	100	11.151	8346	1	136	25	.077	.1	10	1.9	4	16.0
7 3 HG	16	.090	13.34	1775	13.432	21228	2	287	931	.113	.3	32	105.2	85	3.0
8 16 HG	10	.090	11.10	120	11.191	8346	1	136	30	.077	.1	10	2.3	4	16.0
9 C.T.	71	.090	8.65	14	8.747	3629	3	75	2	.143	.4	11	.3	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											.1	9	8.4		
1 IDLE	15	.090	10.80	45	10.892	3538	1	59	5	.232	.1	14	1.1	0	15.2
2 16 HG	10	.080	11.20	90	11.281	8346	1	120	22	.077	.1	9	1.7	4	16.0
3 10 HG	10	.080	11.86	210	11.941	12020	1	163	70	.147	.1	24	10.3	28	10.0
4 16 HG	9	.080	11.11	100	11.191	8346	1	121	25	.077	.1	9	1.9	4	16.0
5 19 HG	13	.090	10.67	70	10.761	6124	1	103	13	.057	.0	6	.8	0	19.0
6 16 HG	36	.080	11.07	100	11.154	8346	3	121	25	.077	.2	9	1.9	4	16.0
7 3 HG	13	.090	13.28	1687	13.371	21228	2	289	889	.113	.2	33	100.5	85	3.0
8 16 HG	9	.080	10.97	110	11.051	8346	1	122	28	.077	.1	9	2.1	4	16.0
9 C.T.	69	.080	8.58	14	8.667	3629	3	68	2	.143	.4	10	.3	0	22.2
----------CYCLE COMPOSITE IN GM/BHP HR----------											.1	8	8.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------											.1	9	8.2		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------											.1	8	8.3		

FOUR CYCLE COMPOSITE -

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HC- FID  0.35(    .1) + 0.65(    .1) =    .095  GM/BHP HR
CO- NDIR 0.35(   8.8) + 0.65(   8.4) =   8.578  GM/BHP HR
NO2-CL   0.35(   8.2) + 0.65(   8.3) =   8.240  GM/BHP HR
                        CORRECTED NO2 =   8.746  GM/BHP HR
                                 BSFC =   1.250  LB/BHP HR
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                         TABLE F-35 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP   TEST 75   RUN-2  O CAT-AIR-EGR 10 PCT. 08-20-73      K =1.070      HUM =101.9  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR          MAN.
MODE          HC     CO     CO2      NO     CARBON    CONS.      HC      CO     NO2     FACT.    HC      CO     NO2     HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE        21    .060    9.76     59     9.843     3538        8      44       6     .232     1.9     10     1.5     0     15.2
2 16 MG       19    .050   11.03     92    11.101     8346       15      76      23     .077     1.2      6     1.8     4     16.0
3 10 MG       23    .060   11.59    191    11.675    12020       26     125      65     .147     3.8     18     9.6    28     10.0
4 16 MG       41    .060   10.82    118    10.924     8346       34      93      30     .077     2.6      7     2.3     4     16.0
5 19 MG       45    .060   10.37     96    10.479     6124       28      71      19     .057     1.6      4     1.1     0     19.0
6 16 MG       44    .060   10.88    121    10.988     8346       36      92      31     .077     2.8      7     2.3     4     16.0
7  3 MG       28    .050   13.36   1693    13.440    21228       48     160     888     .113     5.4     18   100.3    85      3.0
8 16 MG       26    .060   10.93    128    11.018     8346       21      92      32     .077     1.6      7     2.5     4     16.0
9 C.T.        35    .050    8.69     45     8.778     3629       16      42       6     .143     2.2      6      .9     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.6      6     8.2
1 IDLE        21    .060    9.76     59     9.843     3538        8      44       6     .232     1.9     10     1.5     0     15.2
2 16 MG       37    .060   11.08    139    11.180     8346       30      90      33     .077     2.3      7     2.6     4     16.0
3 10 MG       25    .050   11.67    220    11.747    12020       28     103      75     .147     4.1     15    11.0    28     10.0
4 16 MG       22    .050   11.16    146    11.234     8346       18      75      36     .077     1.4      6     2.8     4     16.0
5 19 MG       14    .050   10.67    126    10.735     6124        9      58      24     .057      .5      3     1.4     0     19.0
6 16 MG       36    .060   11.10    145    11.199     8346       29      90      36     .077     2.2      7     2.8     4     16.0
7  3 MG       47    .050   13.39   1819    13.491    21228       80     159     950     .113     9.0     18   107.4    85      3.0
8 16 MG       49    .050   10.93    146    11.033     8346       40      76      37     .077     3.1      6     2.8     4     16.0
9 C.T.        53    .050    8.72     60     8.827     3629       24      42       8     .143     3.4      6     1.2     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.9      5     9.0
1 IDLE        26    .050   10.89     91    10.968     3538        9      33      10     .232     2.1      8     2.3     0     15.2
2 16 MG       38    .050   11.09    144    11.181     8346       31      75      36     .077     2.4      6     2.7     4     16.0
3 10 MG       20    .050   11.76    246    11.832    12020       22     103      83     .147     3.2     15    12.2    28     10.0
4 16 MG       25    .050   11.18    146    11.257     8346       20      75      36     .077     1.5      6     2.8     4     16.0
5 19 MG       32    .050   10.74    127    10.825     6124       20      57      24     .057     1.1      3     1.4     0     19.0
6 16 MG       39    .050   11.02    149    11.112     8346       32      76      37     .077     2.4      6     2.9     4     16.0
7  3 MG       48    .050   13.32   1796    13.422    21228       82     160     943     .113     9.3     18   106.6    85      3.0
8 16 MG       51    .040   10.85    146    10.945     8346       42      62      37     .077     3.2      5     2.8     4     16.0
9 C.T.        47    .040    8.63     67     8.721     3629       21      34       9     .143     3.0      5     1.3     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.9      5     9.1
1 IDLE        26    .050   10.89     91    10.968     3538        9      33      10     .232     2.1      8     2.3     0     15.2
2 16 MG       22    .040   11.11    152    11.174     8346       18      60      38     .077     1.4      5     2.9     4     16.0
3 10 MG       20    .050   11.17    282    11.242    12020       23     108     100     .147     3.4     16    14.7    28     10.0
4 16 MG       22    .050   11.09    158    11.164     8346       18      76      39     .077     1.4      6     3.0     4     16.0
5 19 MG       22    .040   10.60    124    10.664     6124       14      46      24     .057      .8      3     1.3     0     19.0
6 16 MG       24    .050   11.06    166    11.136     8346       19      76      41     .077     1.5      6     3.2     4     16.0
7  3 MG       42    .050   13.35   1693    13.445    21228       72     159     887     .113     8.1     18   100.3    85      3.0
8 16 MG       32    .050   11.01    171    11.095     8346       26      76      43     .077     2.0      6     3.3     4     16.0
9 C.T.        25    .040    8.61     75     8.677     3629       11      34      10     .143     1.6      5     1.5     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------     1.5      5     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------     1.7      5     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------     1.7      5     9.0
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     1.7) + 0.65(     1.7) =    1.705   GM/BHP HR
                                       CO- NDIR 0.35(     5.4) + 0.65(     4.8) =    5.011   GM/BHP HR
                                       NO2-NDIR 0.35(     8.6) + 0.65(     9.0) =    8.861   GM/BHP HR
                                                          CORRECTED NO2 =    9.480   GM/BHP HR
                                                                   BSFC =    1.250   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE         HC-FID   CO     CO2    NO-CL   CARBON    CONS.      HC      CO     NO2     FACT.  HC-FID    CO   NO2-CL   HP     VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE        25    .060    9.76     45     9.823     3538        1      44       5     .232      .2     10     1.2     0     15.2
2 16 MG       23    .050   11.03     80    11.082     8346        2      76      20     .077      .1      6     1.5     4     16.0
3 10 MG       20    .060   11.59    170    11.652    12020        2     125      58     .147      .3     18     8.6    28     10.0
4 16 MG       23    .060   10.82    100    10.882     8346        2      93      25     .077      .1      7     2.0     4     16.0
5 19 MG       21    .060   10.37     70    10.432     6124        1      71      14     .057      .1      4      .8     0     19.0
6 16 MG       22    .060   10.88     95    10.942     8346        2      92      24     .077      .1      7     1.9     4     16.0
7  3 MG       19    .050   13.36   1663    13.412    21228        3     160     874     .113      .3     18    98.7    85      3.0
8 16 MG       24    .060   10.93    110    10.992     8346        2      92      28     .077      .1      7     2.1     4     16.0
9 C.T.        64    .050    8.69     30     8.746     3629        3      42       4     .143      .4      6      .6     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .1      6     7.9
1 IDLE        25    .060    9.76     45     9.823     3538        1      44       5     .232      .2     10     1.2     0     15.2
2 16 MG       20    .060   11.08     95    11.142     8346        1      91      24     .077      .1      7     1.8     4     16.0
3 10 MG       13    .050   11.67    200    11.721    12020        1     104      68     .147      .2     15    10.0    28     10.0
4 16 MG       20    .050   11.16    105    11.212     8346        1      75      26     .077      .1      6     2.0     4     16.0
5 19 MG       15    .050   10.67     75    10.722     6124        1      58      14     .057      .1      3      .8     0     19.0
6 16 MG       22    .060   11.10    105    11.162     8346        2      91      26     .077      .1      7     2.0     4     16.0
7  3 MG       30    .050   13.39   1775    13.443    21228        5     159     931     .113      .5     18   105.2    85      3.0
8 16 MG       19    .050   10.93    115    10.982     8346        1      77      29     .077      .1      6     2.2     4     16.0
9 C.T.        51    .050    8.72     30     8.775     3629        2      42       4     .143      .3      6      .6     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .1      5     8.5
1 IDLE        15    .050   10.89     45    10.942     3538        0      33       5     .232      .1      8     1.1     0     15.2
2 16 MG       23    .050   11.09    100    11.142     8346        2      76      25     .077      .1      6     1.9     4     16.0
3 10 MG       11    .050   11.76    205    11.811    12020        1     103      69     .147      .2     15    10.2    28     10.0
4 16 MG       20    .050   11.18    105    11.232     8346        1      75      26     .077      .1      6     2.0     4     16.0
5 19 MG       13    .050   10.74     75    10.791     6124        1      57      14     .057      .0      3      .8     0     19.0
6 16 MG       22    .050   11.02    105    11.072     8346        2      76      26     .077      .1      6     2.0     4     16.0
7  3 MG       30    .050   13.32   1775    13.373    21228        5     160     935     .113      .5     18   105.7    85      3.0
8 16 MG       25    .040   10.85    115    10.893     8346        2      62      29     .077      .1      5     2.3     4     16.0
9 C.T.        56    .040    8.63     20     8.676     3629        2      34       3     .143      .3      5      .4     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .1      5     8.5
1 IDLE        15    .050   10.89     45    10.942     3538        0      33       5     .232      .1      8     1.1     0     15.2
2 16 MG       18    .040   11.11    100    11.152     8346        1      60      25     .077      .1      5     1.9     4     16.0
3 10 MG       11    .050   11.17    220    11.221    12020        1     108      78     .147      .2     16    11.5    28     10.0
4 16 MG       18    .050   11.09    105    11.142     8346        1      76      26     .077      .1      6     2.0     4     16.0
5 19 MG       14    .040   10.60     70    10.641     6124        1      46      13     .057      .0      3      .8     0     19.0
6 16 MG       22    .050   11.06    110    11.112     8346        2      76      27     .077      .1      6     2.1     4     16.0
7  3 MG       28    .050   13.35   1663    13.403    21228        4     160     874     .113      .5     18    98.8    85      3.0
8 16 MG       22    .050   11.01    120    11.062     8346        2      76      30     .077      .1      6     2.3     4     16.0
9 C.T.        54    .040    8.61     25     8.655     3629        2      34       3     .143      .3      5      .5     0     22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------      .1      5     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------      .1      5     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------      .1      5     8.3
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(      .1) + 0.65(      .1) =     .116   GM/BHP HR
                                       CO- NDIR 0.35(     5.5) + 0.65(     4.8) =    5.025   GM/BHP HR
                                       NO2-CL   0.35(     8.2) + 0.65(     8.3) =    8.279   GM/BHP HR
                                                          CORRECTED NO2 =    8.857   GM/BHP HR
                                                                   BSFC =    1.250   LB/BHP HR
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                          TABLE F-34 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-60  RUN-2   0 CAT-AIR-DECEL        08-01-73       K =1.042      HUM = 89.7  GR/LB
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               CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE           HC       CO     CO2      NO    CARBON    CONS.      HC      CO      NO2    FACT.    HC        CO     NO2     HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         19     .060   10.81      73    10.891     3357       6      37        7    .232    1.5         9     1.7      0   19.4
2 16 MG        12     .090   11.25     212    11.353     9163      10     147       57    .077     .8        11     4.4     13   16.0
3 10 MG        10     .080   11.83    1120    11.921    13926      13     189      434    .147    1.9        28    63.9     48   10.0
4 16 MG        10     .080   11.30     229    11.391     9163       9     130       61    .077     .7        10     4.7     13   16.0
5 19 MG         7     .080   10.44     134    10.528     7303       5     112       31    .057     .3         6     1.8      0   19.0
6 16 MG        15     .090   11.39     286    11.496     9163      13     145       76    .077    1.0        11     5.8     13   16.0
7  3 MG        16     .060   13.32    2101    13.397    21410      28     194     1115    .113    3.1        22   126.0     90    3.0
8 16 MG        14     .060   11.41     304    11.485     9163      12      97       81    .077     .9         7     6.2     13   16.0
9 C.T.         14     .060   10.20      83    10.275     4990       7      59       13    .143    1.1         8     1.9      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .5         5    10.2
1 IDLE         19     .060   10.81      73    10.891     3357       6      37        7    .232    1.5         9     1.7      0   19.4
2 16 MG         9     .060   11.33     238    11.400     9163       8      97       64    .077     .6         8     4.9     13   16.0
3 10 MG         9     .050   12.00    1229    12.060    13926      11     117      471    .147    1.6        17    69.3     48   10.0
4 16 MG         7     .060   11.32     254    11.388     9163       6      98       68    .077     .5         8     5.2     13   16.0
5 19 MG        10     .070   10.60     109    10.681     7303       7      97       25    .057     .4         6     1.4      0   19.0
6 16 MG        10     .060   11.44     278    11.511     9163       9      96       73    .077     .7         7     5.7     13   16.0
7  3 MG        16     .060   13.35    2118    13.427    21410      28     193     1121    .113    3.1        22   126.7     90    3.0
8 16 MG        19     .060   11.49     285    11.571     9163      16      96       75    .077    1.3         7     5.8     13   16.0
9 C.T.         18     .060   10.28      69    10.359     4990       9      58       11    .143    1.3         8     1.6      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .5         4    10.5
1 IDLE         26     .070   11.42      59    11.518     3357       8      41        6    .232    1.9        10     1.3      0   19.4
2 16 MG        21     .050   11.35     216    11.423     9163      18      81       58    .077    1.4         6     4.4     13   16.0
3 10 MG        24     .060   11.99    1159    12.076    13926      30     140      444    .147    4.4        21    65.2     48   10.0
4 16 MG        24     .040   11.20     256    11.266     9163      21      66       69    .077    1.6         5     5.3     13   16.0
5 19 MG        19     .040   10.57     107    10.631     7303      14      56       24    .057     .8         3     1.4      0   19.0
6 16 MG        28     .030    8.11     257     8.170     9163      34      68       96    .077    2.6         5     7.4     13   16.0
7  3 MG        20     .040   12.42    2221    12.482    21410      37     139     1265    .113    4.2        16   142.9     90    3.0
8 16 MG         9     .050   11.24     296    11.300     9163       8      82       80    .077     .6         6     6.1     13   16.0
9 C.T.         12     .050   10.22      70    10.283     4990       6      49       11    .143     .9         7     1.6      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .9         4    11.1
1 IDLE         26     .070   11.42      59    11.518     3357       8      41        6    .232    1.9        10     1.3      0   19.0
2 16 MG        27     .060   11.43     224    11.519     9163      23      96       59    .077    1.8         7     4.6     13   16.0
3 10 MG        25     .050   12.04    1230    12.117    13926      31     116      469    .147    4.6        17    69.0     48   10.0
4 16 MG        25     .060   11.46     262    11.547     9163      21      96       69    .077    1.6         7     5.3     13   16.0
5 19 MG        23     .090   10.63      96    10.745     7303      17     124       22    .057    1.0         7     1.2      0   19.0
6 16 MG        24     .050   11.51     262    11.586     9163      20      80       69    .077    1.6         6     5.3     13   16.0
7  3 MG        29     .080   13.43    2160    13.541    21410      50     256     1138    .113    5.6        29   128.6     90    3.0
8 16 MG        24     .040   11.51     270    11.576     9163      21      64       71    .077    1.6         5     5.5     13   16.0
9 C.T.         24     .100   10.32      61    10.446     4990      12      96       10    .143    1.8        14     1.4      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------    1.0         5    10.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .5         5    10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .9         4    10.8
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(     .5) + 0.65(     .9) =     .795   GM/BHP HR
                                    CO- NDIR 0.35(    4.8) + 0.65(    4.3) =    4.471   GM/BHP HR
                                    NO2-NDIR 0.35(   10.4) + 0.65(   10.8) =   10.662   GM/BHP HR
                                                         CORRECTED NO2 =   11.108   GM/BHP HR
                                                                  BSFC =     .958   LB/BHP HR
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               CONCENTRATION AS MEASURED      TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE         HC-FID     CO     CO2   NO-CL    CARBON    CONS.      HC      CO      NO2    FACT.  HC-FID       CO  NO2-CL     HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         65     .060   10.81      55    10.876     3357       2      37        6    .232     .5         9     1.3      0   19.4
2 16 MG        14     .090   11.25     220    11.341     9163       1     147       59    .077     .1        11     4.5     13   16.0
3 10 MG        22     .080   11.83    1100    11.912    13926       3     189      427    .147     .4        28    62.8     48   10.0
4 16 MG        14     .080   11.30     250    11.381     9163       1     130       67    .077     .1        10     5.1     13   16.0
5 19 MG        14     .080   10.44      90    10.521     7303       1     112       21    .057     .1         6     1.2      0   19.0
6 16 MG        12     .090   11.39     270    11.481     9163       1     145       72    .077     .1        11     5.5     13   16.0
7  3 MG        31     .060   13.32    2100    13.383    21410       5     194     1115    .113     .6        22   126.0     90    3.0
8 16 MG        14     .060   11.41     290    11.471     9163       1      97       77    .077     .1         7     5.9     13   16.0
9 C.T.         24     .060   10.20      56    10.262     4990       1      59        9    .143     .2         8     1.3      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1         5    10.1
1 IDLE         65     .060   10.81      50    10.876     3357       2      37        5    .232     .5         9     1.2      0   19.4
2 16 MG        10     .060   11.33     225    11.391     9163       1      97       60    .077     .1         8     4.6     13   16.0
3 10 MG        14     .050   12.00    1200    12.051    13926       2     117      460    .147     .2        17    67.7     48   10.0
4 16 MG        10     .060   11.32     245    11.381     9163       1      98       65    .077     .1         8     5.0     13   16.0
5 19 MG        10     .070   10.60      85    10.671     7303       1      97       19    .057     .0         6     1.1      0   19.0
6 16 MG        10     .060   11.44     270    11.501     9163       1      97       71    .077     .1         7     5.5     13   16.0
7  3 MG        26     .060   13.35    2150    13.413    21410       4     193     1139    .113     .5        22   128.8     90    3.0
8 16 MG        10     .060   11.49     280    11.551     9163       1      96       74    .077     .1         7     5.7     13   16.0
9 C.T.         24     .060   10.28      55    10.342     4990       1      58        9    .143     .2         8     1.3      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1         4    10.4
1 IDLE         24     .070   11.42      50    11.492     3357       1      41        5    .232     .2        10     1.1      0   19.4
2 16 MG        14     .050   11.35     230    11.401     9163       1      81       61    .077     .1         6     4.7     13   16.0
3 10 MG        16     .060   11.99    1175    12.052    13926       2     140      451    .147     .3        21    66.3     48   10.0
4 16 MG        10     .040   11.20     260    11.241     9163       1      66       70    .077     .1         5     5.4     13   16.0
5 19 MG        10     .040   10.57      60    10.611     7303       1      56       14    .057     .0         3      .8      0   19.0
6 16 MG        10     .030    8.11     250     8.141     9163       1      68       93    .077     .1         5     7.2     13   16.0
7  3 MG        26     .040   12.42    2250    12.463    21410       4     139     1283    .113     .5        16   145.0     90    3.0
8 16 MG        14     .050   11.24     280    11.291     9163       1      82       75    .077     .1         6     5.8     13   16.0
9 C.T.         24     .050   10.22      55    10.272     4990       1      49        9    .143     .2         7     1.3      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1         4    11.2
1 IDLE         24     .070   11.42      50    11.492     3357       1      41        5    .232     .2        10     1.1      0   19.0
2 16 MG        10     .060   11.43     230    11.491     9163       1      97       61    .077     .1         7     4.7     13   16.0
3 10 MG        14     .050   12.04    1200    12.091    13926       2     116      459    .147     .2        17    67.5     48   10.0
4 16 MG        10     .060   11.46     260    11.521     9163       1      96       69    .077     .1         7     5.3     13   16.0
5 19 MG        10     .090   10.63      80    10.721     7303       1     124       18    .057     .0         7     1.0      0   19.0
6 16 MG        10     .050   11.51     270    11.561     9163       1      80       71    .077     .1         6     5.5     13   16.0
7  3 MG        26     .080   13.43    2225    13.513    21410       4     256     1170    .113     .5        29   132.3     90    3.0
8 16 MG        12     .040   11.51     260    11.551     9163       1      64       68    .077     .1         5     5.2     13   16.0
9 C.T.         24     .100   10.32      55    10.422     4990       1      97        9    .143     .2        14     1.3      0   20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1         5    10.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .1         5    10.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .1         4    10.9
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(     .1) + 0.65(     .1) =     .073   GM/BHP HR
                                    CO- NDIR 0.35(    4.8) + 0.65(    4.3) =    4.479   GM/BHP HR
                                    NO2-CL   0.35(   10.3) + 0.65(   10.9) =   10.683   GM/BHP HR
                                                         CORRECTED NO2 =   11.130   GM/BHP HR
                                                                  BSFC =     .958   LB/BHP HR
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                       TABLE F-35 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-8P  TEST-60  RUN-3   0 CAT-DECEL            08-02-73       K =1.115      HUM =141.3  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR                MAN.
MODE           HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.    HC        CO    NO2     HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         76   1.430   12.74     95   14.252    3402      20     690       8    .232    4.5      160    1.7      0     14.4
2 16 MG        22    .040   14.24    241   14.304    9027      15      51      50    .077    1.2        4    3.9     13     16.0
3 10 MG        13    .060   13.84   1262   13.914   13744      14     120     414    .147    2.0       18   60.8     48     10.0
4 16 MG         8    .030   14.26    256   14.299    9027       5      38      54    .077     .4        3    4.1     13     16.0
5 19 MG         6    .160   14.47    132   14.636    7348       3     162      22    .057     .2        9    1.3      0     19.0
6 16 MG        14    .090   14.28    236   14.385    9027       9     114      49    .077     .7        9    3.8     13     16.0
7  3 MG        19    .240   14.59   1370   14.851   21682      30     708     664    .113    3.4       80   75.0     91      3.0
8 16 MG        18    .060   14.47    247   14.549    9027      12      75      51    .077     .9        6    3.9     13     16.0
9 C.T.         37    .730   14.21     64   14.980    5126      14     505       7    .143    2.0       72    1.0      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .7       17    7.2
1 IDLE         76   1.430   12.74     95   14.252    3402      20     690       8    .232    4.5      160    1.7      0     14.4
2 16 MG        23    .100   14.30    227   14.425    9027      16     126      47    .077    1.2       10    3.6     13     16.0
3 10 MG        17    .050   14.06   1273   14.118   13744      18      98     411    .147    2.6       14   60.5     48     10.0
4 16 MG        23    .090   14.37    224   14.485    9027      15     113      46    .077    1.2        9    3.6     13     16.0
5 19 MG        23    .170   14.59     90   14.785    7348      12     171      15    .057     .7       10     .8      0     19.0
6 16 MG        29    .070   14.44    199   14.536    9027      16      88      41    .077    1.2        7    3.2     13     16.0
7  3 MG        22    .170   14.67   1394   14.864   21682      35     501     675    .113    3.9       57   76.3     91      3.0
8 16 MG        16    .070   14.55    226   14.637    9027      11      87      46    .077     .8        7    3.6     13     16.0
9 C.T.         39    .920   14.19     53   15.152    5126      14     629       6    .143    2.0       90     .9      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .9       17    7.2
1 IDLE         69   2.250   12.92     77   15.245    3402      17    1014       6    .232    3.9      235    1.3      0     14.4
2 16 MG        26    .070   14.38    189   14.478    9027      18      88      39    .077    1.3        7    3.0     13     16.0
3 10 MG        24    .040   14.04   1327   14.106   13744      25      79     429    .147    3.7       12   63.1     48     10.0
4 16 MG        25    .080   14.45    214   14.557    9027      17     100      44    .077    1.3        8    3.4     13     16.0
5 19 MG        23    .130   14.64     64   14.795    7348      12     130      11    .057     .7        7     .6      0     19.0
6 16 MG        25    .060   14.45    239   14.537    9027      17      75      49    .077    1.3        6    3.8     13     16.0
7  3 MG        13    .260   14.69   1324   14.964   21682      20     732     640    .113    2.3       83   72.3     91      3.0
8 16 MG        19    .050   14.54    237   14.611    9027      13      62      49    .077    1.0        5    3.7     13     16.0
9 C.T.         40    .940   14.14     55   15.123    5126      15     644       6    .143    2.1       92     .9      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .8       21    7.1
1 IDLE         69   2.250   12.92     77   15.245    3402      17    1014       6    .232    3.9      235    1.3      0     14.4
2 16 MG        26    .130   14.42    189   14.578    9027      17     163      39    .077    1.3       13    3.0     13     16.0
3 10 MG        25    .050   14.07   1301   14.147   13744      26      98     420    .147    3.9       14   61.7     48     10.0
4 16 MG        18    .080   14.51    198   14.609    9027      12     100      41    .077     .9        8    3.1     13     16.0
5 19 MG        19    .280   14.54     87   14.841    7348      10     280      14    .057     .6       16     .8      0     19.0
6 16 MG        22    .060   14.48    191   14.564    9027      14      75      39    .077    1.1        6    3.0     13     16.0
7  3 MG        30    .250   14.62   1202   14.902   21682      47     735     581    .113    5.3       83   65.6     91      3.0
8 16 MG        26    .090   14.59    182   14.708    9027      17     112      37    .077    1.3        9    2.9     13     16.0
9 C.T.         44    .920   14.15     53   15.118    5126      16     630       6    .143    2.3       90     .9      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     1.0       22    6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      .8       17    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      .9       22    6.9
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     .8) + 0.65(     .9) =     .852   GM/BHP HR
                                         CO- NDIR 0.35(   16.8) + 0.65(   21.6) =   19.925   GM/BHP HR
                                         NO2=NDIR 0.35(    7.2) + 0.65(    6.9) =    6.979   GM/BHP HR
                                                           CORRECTED NO2 =    7.780   GM/BHP HR
                                                                    BSFC =     .943   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR                MAN.
MODE          HC-FID   CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL   HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE       1668   1.430   12.74     30   14.337    3402      40     685       2    .232    9.2      159     .5      0     14.4
2 16 MG        57    .040   14.24    230   14.286    9027       4      51      48    .077     .3        4    3.7     13     16.0
3 10 MG        43    .060   13.84   1200   13.904   13744       4     120     394    .147     .6       18   57.9     48     10.0
4 16 MG        32    .030   14.26    230   14.293    9027       2      38      48    .077     .2        3    3.7     13     16.0
5 19 MG        26    .160   14.47     70   14.633    7348       1     162      12    .057     .1        9     .7      0     19.0
6 16 MG        28    .090   14.28    200   14.373    9027       2     114      42    .077     .1        9    3.2     13     16.0
7  3 MG        89    .240   14.59   1425   14.839   21682      13     708     691    .113    1.5       80   78.1     91      3.0
8 16 MG        32    .060   14.47    240   14.533    9027       2      75      49    .077     .2        6    3.8     13     16.0
9 C.T.        533    .730   14.21     18   14.993    5126      18     504       2    .143    2.6       72     .3      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .7       17    7.1
1 IDLE       1668   1.430   12.74     30   14.337    3402      40     685       2    .232    9.2      159     .5      0     14.4
2 16 MG        57    .100   14.30    200   14.406    9027       4     127      42    .077     .3       10    3.2     13     16.0
3 10 MG        43    .050   14.05   1150   14.104   13744       4      98     372    .147     .6       14   54.7     48     10.0
4 16 MG        31    .090   14.37    200   14.463    9027       2     113      41    .077     .1        9    3.2     13     16.0
5 19 MG        64    .170   14.59     30   14.766    7348       3     171       5    .057     .2       10     .3      0     19.0
6 16 MG        32    .070   14.44    200   14.513    9027       2      88      41    .077     .2        7    3.2     13     16.0
7  3 MG       107    .170   14.67   1300   14.851   21682      16     501     630    .113    1.8       57   71.2     91      3.0
8 16 MG        32    .070   14.55    200   14.623    9027       2      87      41    .077     .2        7    3.2     13     16.0
9 C.T.        499    .920   14.19     15   15.160    5126      17     628       2    .143    2.4       90     .2      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .7       17    6.5
1 IDLE       1553   2.250   12.92     20   15.325    3402      34    1009       1    .232    8.0      234     .3      0     14.4
2 16 MG        59    .070   14.38    170   14.456    9027       4      88      35    .077     .3        7    2.7     13     16.0
3 10 MG        50    .040   14.04   1300   14.085   13744       5      79     421    .147     .7       12   61.9     48     10.0
4 16 MG        39    .080   14.45    200   14.534    9027       2     100      41    .077     .2        8    3.2     13     16.0
5 19 MG        64    .130   14.64     30   14.776    7348       3     131       5    .057     .2        7     .3      0     19.0
6 16 MG        39    .060   14.45    210   14.514    9027       2      75      43    .077     .2        6    3.3     13     16.0
7  3 MG       114    .250   14.69   1325   14.951   21682      17     732     638    .113    1.9       83   72.1     91      3.0
8 16 MG        41    .050   14.54    230   14.594    9027       3      62      47    .077     .2        5    3.6     13     16.0
9 C.T.        534    .940   14.14     16   15.133    5126      18     643       2    .143    2.6       92     .3      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .7       21    6.9
1 IDLE       1553   2.250   12.92     20   15.325    3402      34    1009       1    .232    8.0      234     .3      0     14.4
2 16 MG        57    .130   14.42    160   14.556    9027       4     163      33    .077     .3       13    2.5     13     16.0
3 10 MG        50    .050   14.07   1262   14.125   13744       5      98     408    .147     .7       14   59.9     48     10.0
4 16 MG        43    .080   14.51    180   14.594    9027       3     100      37    .077     .2        8    2.8     13     16.0
5 19 MG        73    .280   14.54     30   14.827    7348       4     280       5    .057     .2       16     .3      0     19.0
6 16 MG        39    .060   14.48    180   14.544    9027       2      75      37    .077     .2        6    2.9     13     16.0
7  3 MG       138    .250   14.62   1250   14.884   21682      20     736     605    .113    2.3       83   68.3     91      3.0
8 16 MG        41    .090   14.59    200   14.684    9027       3     112      41    .077     .2        9    3.1     13     16.0
9 C.T.        533    .920   14.15     16   15.123    5126      18     630       2    .143    2.6       90     .3      0     20.4
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------      .7       22    6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------      .7       17    6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------      .7       22    6.7
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     .7) + 0.65(     .7) =     .677   GM/BHP HR
                                         CO- NDIR 0.35(   16.8) + 0.65(   21.5) =   19.876   GM/BHP HR
                                         NO2-CL   0.35(    6.8) + 0.65(    6.7) =    6.737   GM/BHP HR
                                                           CORRECTED NO2 =    7.511   GM/BHP HR
                                                                    BSFC =     .943   LB/BHP HR
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                              TABLE F-36 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP   TEST 60  RUN 4    O CAT-AIR-DECEL-TOC    08-01-73      K =1.047      HUM = 91.6  GR/LB
-------------------------------------------------------------------------------------------------------------------------
MODE              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
                  HC      CO     CO2      NO   CARBON   CONS.     HC      CO     NO2   FACT.    HC      CO     NO2     HP     VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE            19    .090   10.96      86   11.065    3901      5      64      10    .232    1.2     15     2.3      0     -0.0
2 16 MG           18    .060   11.27     179   11.349    8845     15      94      45    .077    1.2      7     3.5      7     -0.0
3 10 MG           25    .080   11.99     677   12.097   14062     32     189     262    .147    4.6     28    38.6     40     -0.0
4 16 MG           25    .090   11.35     180   11.467    8845     21     140      46    .077    1.6     11     3.5      7     -0.0
5 19 MG           25    .070   10.54     116   10.637    8346     21     111      30    .057    1.2      6     1.7      0     -0.0
6 16 MG           17    .070   11.37     176   11.458    8845     14     109      45    .077    1.1      8     3.5      7     -0.0
7  3 MG           16    .100   11.37    1561   11.487   21279     32     374     960    .113    3.6     42   108.5     83     -0.0
8 16 MG           11    .040   11.58     211   11.632    8845      9      61      53    .077     .7      5     4.1      7     -0.0
9 C.T.            11    .070   10.16      71   10.242    5080      6      70      12    .143     .8     10     1.7      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .9      8     9.7
1 IDLE            19    .090   10.96      86   11.065    3901      5      64      10    .232    1.2     15     2.3      0     -0.0
2 16 MG           17    .080   11.44     187   11.538    8845     14     124      48    .077    1.1     10     3.7      7     -0.0
3 10 MG           24    .070   12.07     719   12.166   14062     30     163     276    .147    4.4     24    40.6     40     -0.0
4 16 MG           28    .070   11.44     176   11.540    8845     23     108      45    .077    1.8      8     3.4      7     -0.0
5 19 MG           15    .090   10.70     101   10.806    8346     13     140      26    .057     .7      8     1.5      0     -0.0
6 16 MG           15    .060   11.56     182   11.636    8845     12      92      46    .077     .9      7     3.5      7     -0.0
7  3 MG           20    .080   13.49    1700   13.592   21279     34     254     887    .113    3.8     29   100.2     83     -0.0
8 16 MG           24    .040   11.65     199   11.716    8845     20      61      50    .077    1.5      5     3.8      7     -0.0
9 C.T.            23    .060   10.24      62   10.325    5080     12      60      10    .143    1.7      9     1.4      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     1.0      7     9.3
1 IDLE            22    .040   11.48      95   11.544    3901      8      27      11    .232    1.9      6     2.5      0     -0.0
2 16 MG           27    .060   11.45     172   11.539    8845     22      93      44    .077    1.7      7     3.4      7     -0.0
3 10 MG           18    .080   11.99     707   12.089   14062     23     188     273    .147    3.3     28    40.1     40     -0.0
4 16 MG           19    .070   11.56     159   11.651    8845     16     107      40    .077    1.2      8     3.1      7     -0.0
5 19 MG           24    .060   10.70     119   10.786    8346     20      94      31    .057    1.1      5     1.7      0     -0.0
6 16 MG           22    .080   11.62     198   11.724    8845     18     122      50    .077    1.4      9     3.8      7     -0.0
7  3 MG           21    .070   13.42    1725   13.513   21279     36     223     902    .113    4.0     25   101.9     83     -0.0
8 16 MG           15    .080   11.64     212   11.736    8845     12     122      53    .077     .9      9     4.1      7     -0.0
9 C.T.            13    .060   10.26      60   10.334    5080      7      60      10    .143    1.0      9     1.4      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------     1.0      6     9.4
1 IDLE            22    .040   11.48      95   11.544    3901      8      27      11    .232    1.9      6     2.5      0     -0.0
2 16 MG           27    .020   11.64     162   11.689    8845     22      31      41    .077    1.7      2     3.2      7     -0.0
3 10 MG           18    .060   12.05     669   12.129   14062     23     141     257    .147    3.3     21    37.9     40     -0.0
4 16 MG           20    .070   11.59     176   11.682    8845     16     107      44    .077    1.3      8     3.4      7     -0.0
5 19 MG           19    .070   10.77     103   10.861    8346     16     109      26    .057     .9      6     1.5      0     -0.0
6 16 MG           23    .040   11.62     181   11.685    8845     19      61      45    .077    1.4      5     3.5      7     -0.0
7  3 MG           12    .070   13.48    1685   13.563   21279     20     222     877    .113    2.3     25    99.2     83     -0.0
8 16 MG           17    .080   11.71     212   11.808    8845     14     121      53    .077    1.1      9     4.1      7     -0.0
9 C.T.            18    .070   10.26      63   10.349    5080     10      69      10    .143    1.4     10     1.5      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .9      5     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     1.0      7     9.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------      .9      6     9.2
FOUR CYCLE COMPOSITE -
                                        HC- NDIR 0.35(      1.0) + 0.65(      .9) =      .934   GM/BHP HR
                                        CO- NDIR 0.35(      7.1) + 0.65(     5.8) =     6.241   GM/BHP HR
                                        NO2-NDIR 0.35(      9.5) + 0.65(     9.2) =     9.292   GM/BHP HR
                                                                CORRECTED NO2 =     9.726   GM/BHP HR
                                                                         BSFC =     1.184   LB/BHP HR
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MODE              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
                HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID    CO   NO2-CL    HP     VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE            11    .090   10.96      70   11.061    3901      0      64       8    .232     .1     15     1.9      0     -0.0
2 16 MG            7    .060   11.27     150   11.331    8845      1      95      39    .077     .0      7     3.0      7     -0.0
3 10 MG            6    .080   11.99     650   12.081   14062      1     189     252    .147     .1     28    37.1     40     -0.0
4 16 MG            3    .090   11.35     160   11.440    8845      0     141      41    .077     .0     11     3.2      7     -0.0
5 19 MG            5    .070   10.54      60   10.611    8346      0     111      16    .057     .0      6      .9      0     -0.0
6 16 MG            3    .070   11.37     105   11.440    8845      0     109      27    .077     .0      8     2.1      7     -0.0
7  3 MG           10    .100   11.37    1525   11.471   21279      2     375     939    .113     .2     42   106.1     83     -0.0
8 16 MG            6    .040   11.58     170   11.621    8845      0      62      43    .077     .0      5     3.3      7     -0.0
9 C.T.            15    .070   10.16      45   10.232    5080      1      70       7    .143     .1     10     1.1      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .0      8     9.2
1 IDLE            11    .090   10.96      70   11.061    3901      0      64       8    .232     .1     15     1.9      0     -0.0
2 16 MG            6    .080   11.44     160   11.521    8845      0     124      41    .077     .0     10     3.1      7     -0.0
3 10 MG            6    .070   12.07     700   12.141   14062      1     164     269    .147     .1     24    39.6     40     -0.0
4 16 MG            6    .070   11.44     160   11.511    8845      0     109      41    .077     .0      8     3.1      7     -0.0
5 19 MG            5    .090   10.70      65   10.791    8346      0     141      17    .057     .0      8     1.0      0     -0.0
6 16 MG            2    .060   11.56     165   11.620    8845      0      92      42    .077     .0      7     3.2      7     -0.0
7  3 MG           15    .080   13.49    1663   13.581   21279      2     254     869    .113     .3     29    98.2     83     -0.0
8 16 MG            7    .040   11.65     185   11.691    8845      1      61      46    .077     .0      5     3.6      7     -0.0
9 C.T.            18    .060   10.24      45   10.302    5080      1      60       7    .143     .1      9     1.1      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .0      7     8.9
1 IDLE             6    .040   11.48      70   11.521    3901      0      27       8    .232     .0      6     1.8      0     -0.0
2 16 MG            6    .060   11.45     145   11.511    8845      0      93      37    .077     .0      7     2.8      7     -0.0
3 10 MG            7    .080   11.99     670   12.071   14062      1     188     259    .147     .1     28    38.1     40     -0.0
4 16 MG            6    .070   11.56     165   11.631    8845      0     108      42    .077     .0      8     3.2      7     -0.0
5 19 MG            5    .060   10.70      65   10.761    8346      0      94      17    .057     .0      5     1.0      0     -0.0
6 16 MG            3    .080   11.62     180   11.700    8845      0     122      45    .077     .0      9     3.5      7     -0.0
7  3 MG            9    .070   13.42    1675   13.491   21279      1     223     877    .113     .2     25    99.1     83     -0.0
8 16 MG            3    .080   11.64     175   11.720    8845      0     122      44    .077     .0      9     3.4      7     -0.0
9 C.T.            10    .060   10.26      50   10.321    5080      0      60       8    .143     .1      9     1.2      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .0      6     8.9
1 IDLE             6    .040   11.48      70   11.521    3901      0      27       8    .232     .0      6     1.8      0     -0.0
2 16 MG            3    .020   11.54     160   11.560    8845      0      31      41    .077     .0      2     3.1      7     -0.0
3 10 MG            4    .060   12.05     660   12.110   14062      1     141     254    .147     .1     21    37.4     40     -0.0
4 16 MG            3    .070   11.59     165   11.660    8845      0     107      42    .077     .0      8     3.2      7     -0.0
5 19 MG            3    .070   10.77      65   10.840    8346      0     109      17    .057     .0      6      .9      0     -0.0
6 16 MG            6    .040   11.62     172   11.661    8845      0      61      43    .077     .0      5     3.3      7     -0.0
7  3 MG            9    .070   13.48    1675   13.551   21279      1     222     873    .113     .2     25    98.7     83     -0.0
8 16 MG            6    .080   11.71     180   11.791    8845      0     121      45    .077     .0      9     3.5      7     -0.0
9 C.T.            12    .070   10.26      50   10.331    5080      1      70       8    .143     .1     10     1.2      0     -0.0
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------      .0      5     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------      .0      7     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------      .0      6     8.9
FOUR CYCLE COMPOSITE -
                                        HC- FID  0.35(       .0) + 0.65(      .0) =      .032   GM/BHP HR
                                        CO- NDIR 0.35(      7.1) + 0.65(     5.8) =     6.252   GM/BHP HR
                                        NO2-CL   0.35(      9.0) + 0.65(     8.9) =     8.931   GM/BHP HR
                                                                CORRECTED NO2 =     9.348   GM/BHP HR
                                                                         BSFC =     1.184   LB/BHP HR
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                      TABLE F-37 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-OP TEST-60 RUN-5 O CAT AIR-DEC-TDC-JETS-59 08-01-73      K =1.061      HUM = 97.6  GR/LB
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MODE          CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR     WT.        WEIGHTED GM/HR         MAN.
               HC     CO     CO2     NO   CARBON   CONS.      HC     CO    NO2   FACT.   HC      CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         15   .090   11.35     97   11.456    3720       5     59     10   .232    1.2     14    2.9     0   -0.0
2 16 MG        20   .060   11.09    170   11.172    8755      17     95     44   .077    1.3      7    3.4     6   -0.0
3 10 MG        19   .060   11.45    501   11.531   13381      24    141    193   .147    3.5     21   28.4    35   -0.0
4 16 MG        16   .070   11.14    157   11.227    8755      13    110     41   .077    1.0      8    3.1     6   -0.0
5 19 MG        21   .080   10.61    129   10.713    8256      17    125     33   .057    1.0      7    1.9     0   -0.0
6 16 MG        19   .110   11.11    176   11.241    8755      16    173     46   .077    1.2     13    3.5     6   -0.0
7  3 MG        20   .070   12.85   1638   12.942   21773      36    238    915   .113    4.1     27  103.4    81   -0.0
8 16 MG        20   .080   11.26    211   11.362    8755      17    125     54   .077    1.3     10    4.2     7   -0.0
9 C.T.         19   .080    9.93     58   10.031    5080      10     82     10   .143    1.5     12    1.4     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------    1.0      7    9.3
1 IDLE         15   .080   11.35     97   11.446    3720       5     53     10   .232    1.2     12    2.4     0   -0.0
2 16 MG        18   .070   11.16    176   11.249    8755      15    110     45   .077    1.2      8    3.5     6   -0.0
3 10 MG        15   .050   11.47    526   11.536   13381      19    117    203   .147    2.8     17   29.8    35   -0.0
4 16 MG        22   .090   11.21    198   11.324    8755      18    141     51   .077    1.4     11    3.9     6   -0.0
5 19 MG        12   .070   10.25     91   10.333    8256      10    113     24   .057     .6      6    1.4     0   -0.0
6 16 MG         9   .060   11.23    167   11.300    8755       8     94     43   .077     .6      7    3.3     6   -0.0
7  3 MG        10   .090   12.83   1687   12.931   21773      18    306    943   .113    2.1     35  106.6    81   -0.0
8 16 MG        13   .080   11.23    181   11.324    8755      11    125     46   .077     .8     10    3.6     7   -0.0
9 C.T.         11   .070    9.95     52   10.032    5080       6     72      9   .143     .9     10    1.3     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7      7    9.6
1 IDLE         15   .080   11.20     81   11.296    3720       5     53      9   .232    1.2     12    2.1     0   -0.0
2 16 MG        17   .040   11.21    170   11.268    8755      14     63     44   .077    1.1      5    3.4     6   -0.0
3 10 MG        19   .120   11.47    486   11.611   13381      24    279    186   .147    3.5     41   27.3    35   -0.0
4 16 MG        19   .050   11.21    182   11.281    8755      16     78     47   .077    1.2      6    3.6     6   -0.0
5 19 MG        20   .050   10.44     86   10.512    8256      17     79     22   .057    1.0      5    1.3     0   -0.0
6 16 MG        17   .060   11.15    169   11.228    8755      14     95     44   .077    1.1      7    3.4     6   -0.0
7  3 MG        20   .070   12.79   1735   12.882   21773      37    239    974   .113    4.1     27  110.0    81   -0.0
8 16 MG        19   .050   11.32    199   11.391    8755      16     78     51   .077    1.2      6    3.9     7   -0.0
9 C.T.         14   .050    9.90     49    9.965    5080       8     51      8   .143    1.1      7    1.2     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------    1.0      7    9.6
1 IDLE         15   .080   11.20     81   11.296    3720       5     53      9   .232    1.2     12    2.1     0   -0.0
2 16 MG        17   .070   11.14    169   11.228    8755      14    110     44   .077    1.1      8    3.4     6   -0.0
3 10 MG        16   .060   11.50    523   11.577   13381      20    140    201   .147    2.9     21   29.5    35   -0.0
4 16 MG        22   .030   11.12    199   11.174    8755      19     47     52   .077    1.4      4    4.0     6   -0.0
5 19 MG        25   .020   10.36     89   10.407    8256      21     32     23   .057    1.2      2    1.3     0   -0.0
6 16 MG        19   .070   11.15    157   11.241    8755      16    110     41   .077    1.2      8    3.1     6   -0.0
7  3 MG        24   .090   12.82   1669   12.936   21773      44    306    933   .113    4.9     35  105.4    81   -0.0
8 16 MG        23   .090   11.20    211   11.315    8755      19    141     54   .077    1.5     11    4.2     7   -0.0
9 C.T.         23   .070    9.88     96    9.975    5080      13     72      8   .143    1.8     10    1.1     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------    1.1      7    9.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .9      7    9.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    1.0      7    9.5
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(     .9) + 0.65(    1.0) =     .957   GM/BHP HR
                                         CO- NDIR 0.35(    7.3) + 0.65(    7.0) =    7.092   GM/BHP HR
                                         NO2-NDIR 0.35(    9.5) + 0.65(    9.5) =    9.519   GM/BHP HR
                                                               CORRECTED NO2 =   10.099   GM/BHP HR
                                                                        BSFC =    1.247   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR     WT.        WEIGHTED GM/HR           MAN.
             HC-FID    CO    CO2  NO-CL   CARBON   CONS.      HC     CO    NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         12   .090   11.35     65   11.441    3720       0     59      7   .232     .1     14    1.6     0   -0.0
2 16 MG         7   .060   11.09    145   11.151    8755       1     95     38   .077     .0      7    2.9     6   -0.0
3 10 MG         7   .060   11.45    470   11.511   13381       1    141    181   .147     .1     21   26.7    35   -0.0
4 16 MG         6   .070   11.14    145   11.211    8755       0    110     38   .077     .0      8    2.9     6   -0.0
5 19 MG         9   .080   10.61     60   10.691    8256       1    125     15   .057     .0      7     .9     0   -0.0
6 16 MG         6   .110   11.11    155   11.221    8755       0    173     40   .077     .0     13    3.1     6   -0.0
7  3 MG        15   .070   12.85   1600   12.921   21773       2    238    895   .113     .3     27  101.1    81   -0.0
8 16 MG         9   .080   11.26    160   11.341    8755       1    125     41   .077     .1     10    3.2     7   -0.0
9 C.T.         31   .080    9.93     45   10.013    5080       2     82      8   .143     .2     12    1.1     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1      7    8.8
1 IDLE         12   .080   11.35     65   11.431    3720       0     53      7   .232     .1     12    1.6     0   -0.0
2 16 MG         7   .070   11.16    145   11.231    8755       1    110     38   .077     .0      8    2.9     6   -0.0
3 10 MG         7   .050   11.47    490   11.521   13381       1    117    189   .147     .1     17   27.8    35   -0.0
4 16 MG         7   .090   11.21    145   11.301    8755       1    141     37   .077     .0     11    2.9     6   -0.0
5 19 MG        10   .070   10.25     50   10.321    8256       1    113     13   .057     .0      6     .6     0   -0.0
6 16 MG         7   .060   11.23    160   11.291    8755       1     94     41   .077     .0      7    3.2     6   -0.0
7  3 MG        16   .090   12.83   1675   12.922   21773       3    306    937   .113     .3     35  105.9    81   -0.0
8 16 MG        10   .080   11.23    170   11.311    8755       1    125     44   .077     .1     10    3.4     7   -0.0
9 C.T.         28   .070    9.95     45   10.023    5080       1     72      8   .143     .2     10    1.1     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .1      7    9.2
1 IDLE         10   .080   11.20     70   11.281    3720       0     53      8   .232     .1     12    1.8     0   -0.0
2 16 MG         7   .040   11.21    145   11.251    8755       1     63     37   .077     .0      5    2.9     6   -0.0
3 10 MG         7   .120   11.47    480   11.591   13381       1    280    184   .147     .1     41   27.0    35   -0.0
4 16 MG         7   .050   11.21    160   11.261    8755       1     79     41   .077     .0      6    3.2     6   -0.0
5 19 MG         7   .050   10.44     60   10.491    8256       1     79     16   .057     .0      5     .9     0   -0.0
6 16 MG         9   .060   11.15    150   11.211    8755       1     95     39   .077     .1      7    3.0     6   -0.0
7  3 MG        10   .070   12.79   1700   12.861   21773       2    239    955   .113     .2     27  108.0    81   -0.0
8 16 MG         7   .050   11.32    160   11.371    8755       1     78     41   .077     .0      6    3.1     7   -0.0
9 C.T.         25   .050    9.90     40    9.953    5080       1     52      7   .143     .2      7    1.0     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .0      7    9.3
1 IDLE         10   .080   11.20     70   11.281    3720       0     53      8   .232     .1     12    1.8     0   -0.0
2 16 MG         7   .070   11.14    150   11.211    8755       1    110     39   .077     .0      8    3.0     6   -0.0
3 10 MG         7   .060   11.50    510   11.561   13381       1    140    196   .147     .1     21   28.8    35   -0.0
4 16 MG         7   .030   11.12    150   11.151    8755       1     48     39   .077     .0      4    3.0     6   -0.0
5 19 MG         7   .020   10.36     55   10.381    8256       1     32     15   .057     .0      2     .8     0   -0.0
6 16 MG         9   .070   11.15    150   11.221    8755       1    110     39   .077     .1      8    3.0     6   -0.0
7  3 MG        10   .090   12.82   1650   12.911   21773       2    307    924   .113     .2     35  104.4    81   -0.0
8 16 MG         6   .090   11.20    160   11.291    8755       0    141     41   .077     .0     11    3.2     7   -0.0
9 C.T.         29   .070    9.88     40    9.953    5080       2     72      7   .143     .2     10    1.0     0   -0.0
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .0      7    9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .1      7    9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .0      7    9.2
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     .1) + 0.65(     .0) =     .051   GM/BHP HR
                                         CO- NDIR 0.35(    7.3) + 0.65(    7.0) =    7.103   GM/BHP HR
                                         NO2-CL   0.35(    9.0) + 0.65(    9.2) =    9.155   GM/BHP HR
                                                               CORRECTED NO2 =    9.713   GM/BHP HR
                                                                        BSFC =    1.247   LB/BHP HR
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                         TABLE F-38 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-1P  TEST-61  RUN-1   R+O CAT-AIR-64            08-03-73      K =1.008      HUM = 77.7  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE             HC     CO     CO2     NO    CARBON   CONS.      HC      CO      NO2   FACT.    HC         CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE           18   .050   10.68     39    10.749    3357       6      32        4   .232     1.4          7     .8     0   13.9
2 16 HG          18   .070   12.38     44    12.469    9939      15     113       12   .077     1.2          9     .9    16   16.0
3 10 HG          18   .040   12.41     62    12.469   14969      22      93       24   .147     3.3         14    3.5    49   10.0
4 16 HG          12   .040   12.12     46    12.173    9939      11      66       12   .077      .8          5    1.0    16   16.0
5 19 HG          13   .040   10.58     19    10.634    6486       9      49        3   .057      .5          3     .2     0   19.0
6 16 HG          19   .040   12.57     31    12.631    9939      16      64        8   .077     1.2          5     .6    16   16.0
7  3 HG          19   .050   14.13     33    14.201   22453      32     160       17   .113     3.7         18    2.0    89    3.0
8 16 HG          18   .040   12.06     17    12.119    9939      16      66        5   .077     1.2          5     .4    16   16.0
9 C.T.           16   .030    7.49     20     7.537    3720       9      30        3   .143     1.2          4     .5     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .6          3     .4
1 IDLE           18   .050   10.68     39    10.749    3357       6      32        4   .232     1.4          7     .8     0   13.9
2 16 HG          23   .030   12.77     28    12.825    9939      19      47        7   .077     1.5          4     .6    16   16.0
3 10 HG          11   .020   13.45     39    13.482   14969      13      45       13   .147     1.9          7    1.8    49   10.0
4 16 HG          13   .020   12.82     35    12.854    9939      11      31        9   .077      .8          2     .7    16   16.0
5 19 HG          16   .020   11.23     29    11.267    6486      10      23        5   .057      .6          1     .3     0   19.0
6 16 HG          21   .030   12.87     39    12.923    9939      17      47       10   .077     1.3          4     .8    16   16.0
7  3 HG          24   .060   14.51     38    14.596   22453      40     186       19   .113     4.5         21    2.2    89    3.0
8 16 HG          21   .030   12.57     14    12.623    9939      18      48        5   .077     1.4          4     .4    16   16.0
9 C.T.           20   .020    7.53     20     7.572    3720      11      20        3   .143     1.5          3     .5     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .7          2     .4
1 IDLE           28   .010   11.11     28    11.150    3357       9       6        3   .232     2.1          1     .6     0   13.9
2 16 HG          30   .020   12.82     40    12.872    9939      25      31       10   .077     1.9          2     .8    16   16.0
3 10 HG          17   .020   13.55     33    13.588   14969      20      45       12   .147     3.0          7    1.8    49   10.0
4 16 HG          19   .020   12.83     38    12.871    9939      16      31       10   .077     1.2          2     .7    16   16.0
5 19 HG          12   .010   11.17     16    11.193    6486       8      12        3   .057      .4          1     .2     0   19.0
6 16 HG          16   .020   12.83     44    12.867    9939      13      31       11   .077     1.0          2     .9    16   16.0
7  3 HG          19   .030   14.44     50    14.491   22453      32      94       26   .113     3.6         11    2.9    89    3.0
8 16 HG          17   .020   12.76     15    12.798    9939      14      31        4   .077     1.1          2     .3    16   16.0
9 C.T.           17   .020    7.59     17     7.628    3720       9      20        3   .143     1.3          3     .4     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .7          1     .4
1 IDLE           28   .010   11.11     28    11.150    3357       9       6        3   .232     2.1          1     .6     0   13.9
2 16 HG          31   .010   12.73     39    12.773    9939      26      16        9   .077     2.0          1     .7    16   16.0
3 10 HG          29   .010   13.49     45    13.531   14969      35      22       17   .147     5.1          3    2.4    49   10.0
4 16 HG          26   .010   12.71     27    12.748    9939      22      16        7   .077     1.7          1     .5    16   16.0
5 19 HG          24   .020   10.81     19    10.856    6486      15      24        3   .057      .9          1     .2     0   19.0
6 16 HG          23   .010   12.71     40    12.745    9939      19      16       10   .077     1.5          1     .8    16   16.0
7  3 HG          21   .030   14.45     45    14.503   22453      35      94       23   .113     4.0         11    2.6    89    3.0
8 16 HG          19   .030   12.80     19    12.851    9939      16      47        5   .077     1.2          4     .4    16   16.0
9 C.T.           16   .030    7.67     15     7.717    3720       8      29        2   .143     1.2          4     .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .9          1     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------       .7          3     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------       .8          1     .4
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(      .7) + 0.65(      .8) =     .743   GM/BHP HR
                                        CO- NDIR 0.35(     2.7) + 0.65(     1.3) =    1.823   GM/BHP HR
                                        NO2-NDIR 0.35(      .4) + 0.65(      .4) =     .388   GM/BHP HR
                                                              CORRECTED NO2 =     .391   GM/BHP HR
                                                                       BSFC =     .433   LB/BHP HR


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              CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID     CO     CO2  NO-CL   CARBON   CONS.      HC      CO      NO2   FACT.  HC-FID       CO  NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE          140   .050   10.68     14    10.744    3357       4      32        2   .232     1.0          7     .5     0   13.9
2 16 HG         170   .070   12.38     35    12.467    9939      14     113        9   .077     1.0          9     .7    16   16.0
3 10 HG         122   .040   12.41     34    12.462   14969      14      93       13   .147     2.1         14    1.9    49   10.0
4 16 HG         126   .040   12.12     15    12.173    9939      10      66        4   .077      .8          5     .3    16   16.0
5 19 HG          74   .040   10.58      4    10.627    6486       4      49        1   .057      .3          3     .0     0   19.0
6 16 HG         133   .040   12.57     16    12.623    9939      10      64        4   .077      .8          5     .3    16   16.0
7  3 HG          44   .050   14.13     20    14.184   22453      15     160       11   .113     1.7         18    1.2    89    3.0
8 16 HG          38   .040   12.06     11    12.104    9939       3      66        3   .077      .2          5     .2    16   16.0
9 C.T.           27   .030    7.49      1     7.523    3720       1      30        0   .143      .2          4     .0     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .4          3     .2
1 IDLE          140   .050   10.68     14    10.744    3357       4      32        2   .232     1.0          7     .5     0   13.9
2 16 HG         136   .030   12.77     20    12.814    9939      11      47        5   .077      .8          4     .4    16   16.0
3 10 HG          88   .020   13.45     20    13.479   14969      10      45        7   .147     1.4          7    1.1    49   10.0
4 16 HG          70   .020   12.82     15    12.847    9939       5      31        4   .077      .4          2     .3    16   16.0
5 19 HG          40   .020   11.23      4    11.254    6486       2      23        1   .057      .1          1     .0     0   19.0
6 16 HG          84   .030   12.87     14    12.908    9939       6      47        5   .077      .5          4     .4    16   16.0
7  3 HG          79   .060   14.51     30    14.578   22453      12     187       15   .113     1.4         21    1.7    89    3.0
8 16 HG          21   .030   12.57     14    12.602    9939       2      48        4   .077      .1          4     .3    16   16.0
9 C.T.           17   .020    7.53      1     7.552    3720       1      20        0   .143      .1          3     .0     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .3          2     .2
1 IDLE          117   .010   11.11     20    11.132    3357       4       6        2   .232      .8          1     .5     0   13.9
2 16 HG         140   .020   12.82     16    12.854    9939      11      31        4   .077      .8          2     .3    16   16.0
3 10 HG          87   .020   13.55     20    13.579   14969      10      45        7   .147     1.4          7    1.1    49   10.0
4 16 HG          70   .020   12.83     17    12.857    9939       5      31        4   .077      .4          2     .3    16   16.0
5 19 HG          38   .010   11.17     11    11.184    6486       2      12        2   .057      .1          1     .1     0   19.0
6 16 HG          72   .020   12.83     20    12.857    9939       6      31        5   .077      .4          2     .4    16   16.0
7  3 HG          64   .030   14.44     31    14.476   22453       9      94       16   .113     1.0         11    1.8    89    3.0
8 16 HG          21   .020   12.76     16    12.782    9939       2      31        4   .077      .1          2     .3    16   16.0
9 C.T.           20   .020    7.59      2     7.612    3720       1      20        0   .143      .1          3     .0     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .2          1     .2
1 IDLE          117   .010   11.11     20    11.132    3357       4       6        2   .232      .8          1     .5     0   13.9
2 16 HG         146   .010   12.73     16    12.755    9939      11      16        4   .077      .9          1     .3    16   16.0
3 10 HG          82   .010   13.49     21    13.508   14969       9      22        8   .147     1.3          3    1.1    49   10.0
4 16 HG          70   .010   12.71     16    12.727    9939       5      16        4   .077      .4          1     .3    16   16.0
5 19 HG          40   .020   10.81      2    10.834    6486       2      24        0   .057      .1          1     .0     0   19.0
6 16 HG          84   .010   12.71     18    12.728    9939       7      16        5   .077      .5          1     .4    16   16.0
7  3 HG          79   .030   14.45     32    14.488   22453      12      94       16   .113     1.4         11    1.9    89    3.0
8 16 HG          21   .030   12.80     14    12.832    9939       2      47        5   .077      .1          4     .4    16   16.0
9 C.T.           14   .030    7.67      1     7.701    3720       1      29        0   .143      .1          4     .0     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------       .3          1     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------       .3          3     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------       .2          1     .2
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      .3) + 0.65(      .2) =     .270   GM/BHP HR
                                        CO- NDIR 0.35(     2.7) + 0.65(     1.3) =    1.825   GM/BHP HR
                                        NO2-CL   0.35(      .2) + 0.65(      .2) =     .219   GM/BHP HR
                                                              CORRECTED NO2 =     .221   GM/BHP HR
                                                                       BSFC =     .433   LB/BHP HR
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                        TABLE F-39 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-1P  TEST-61  RUN-2   R+O CAT-AIR-64         08-03-73     K =1.016     HUM = 80.2  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.     WEIGHTED GM/HR          MAN.
MODE          HC     CO     CO2     NO     CARBON   CONS.     HC      CO     NO2    FACT.   HC       CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        42   .020    9.59     58     9.655    3357      16      14      7    .232    3.7       3    1.6     0   13.9
2 16 MG       26   .060   11.88     27    11.968    9934      23     101      7    .077    1.8       8     .6    16   16.0
3 10 MG       31   .030   12.49     30    12.559   14969      40      72     12    .147    5.9      11    1.7    44   10.0
4 16 MG       19   .040   11.77     64    11.831    9934      17      68     18    .077    1.3       5    1.4    16   16.0
5 19 MG       10   .030   10.22     49    10.261    6486       7      38     10    .057     .4       2     .6     0   19.0
6 16 MG       18   .020   11.94     46    11.979    9934      16      34     13    .077    1.2       3    1.0    16   16.0
7  3 MG       12   .060   13.86     48    13.933   22453      21     195     26    .113    2.4      22    2.9    84    3.0
8 16 MG       14   .040   11.83     35    11.885    9934      13      68     11    .077    1.0       5     .8    16   16.0
9 C.T.        10   .040    7.48     30     7.531    3720       5      40      5    .143     .8       6     .7     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .8       3     .5
1 IDLE        42   .020    9.59     58     9.655    3357      16      14      7    .232    3.7       3    1.6     0   13.9
2 16 MG       12   .050   11.98     19    12.043    9934      11      83      5    .077     .8       6     .4    16   16.0
3 10 MG       12   .050   12.71     35    12.773   14969      15     118     14    .147    2.2      17    2.0    44   10.0
4 16 MG       10   .040   12.00     20    12.051    9934       9      67      5    .077     .7       5     .4    16   16.0
5 19 MG       10   .050   10.90     32    10.961    6486       7      63      7    .057     .4       4     .4     0   19.0
6 16 MG       14   .050   12.24     19    12.305    9934      12      82      4    .077     .9       6     .3    16   16.0
7  3 MG       10   .050   13.91     41    13.971   22453      17     162     22    .113    2.0      18    2.5    84    3.0
8 16 MG       14   .050   11.84     13    11.905    9934      13      84      4    .077    1.0       6     .3    16   16.0
9 C.T.         6   .040    7.56     20     7.606    3720       3      40      3    .143     .5       6     .5     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .5       3     .4
1 IDLE        19   .030   10.89     26    10.941    3357       6      19      3    .232    1.5       4     .6     0   13.9
2 16 MG       25   .060   12.24     27    12.327    9934      22      98      7    .077    1.7       8     .6    16   16.0
3 10 MG       16   .060   12.76     38    12.837   14969      20     141     15    .147    3.0      21    2.2    44   10.0
4 16 MG       16   .060   11.98     17    12.057    9934      14     100      5    .077    1.1       8     .4    16   16.0
5 19 MG       10   .050   10.37     27    10.431    6486       7      63      6    .057     .4       4     .3     0   19.0
6 16 MG       24   .050   12.16     23    12.236    9934      21      82      6    .077    1.6       6     .5    16   16.0
7  3 MG       13   .070   14.07     36    14.154   22453      22     224     19    .113    2.5      25    2.1    84    3.0
8 16 MG       17   .040   11.90     15    11.958    9934      15      67      4    .077    1.2       5     .3    16   16.0
9 C.T.        14   .050    7.62     18     7.685    3720       7      49      3    .143    1.0       7     .4     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .6       4     .3
1 IDLE        19   .030   10.89     26    10.941    3357       6      19      3    .232    1.5       4     .6     0   13.9
2 16 MG       16   .050   12.24     35    12.307    9934      14      82      9    .077    1.1       6     .7    16   16.0
3 10 MG       21   .060   12.76     18    12.843   14969      26     141      7    .147    3.9      21    1.0    44   10.0
4 16 MG       14   .060   12.01     30    12.085    9934      12     100      8    .077    1.0       8     .6    16   16.0
5 19 MG        9   .050   10.39     15    10.450    6486       6      63      3    .057     .3       4     .2     0   19.0
6 16 MG       19   .060   12.20     21    12.281    9934      17      98      6    .077    1.3       8     .4    16   16.0
7  3 MG       18   .090   14.01     29    14.119   22453      31     289     15    .113    3.5      33    1.7    84    3.0
8 16 MG       16   .050   11.76     22    11.827    9934      15      85      6    .077    1.1       7     .5    16   16.0
9 C.T.        20   .040    7.68     20     7.742    3720      10      39      3    .143    1.5       6     .5     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .7       4     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .7       3     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .6       4     .3
FOUR CYCLE COMPOSITE -               HC- NDIR 0.35(     .7) + 0.65(     .6) =    .659   GM/BHP HR
                                     CO- NDIR 0.35(    3.1) + 0.65(    4.1) =   3.721   GM/BHP HR
                                     NO2-NDIR 0.35(     .4) + 0.65(     .3) =    .350   GM/BHP HR
                                                         CORRECTED NO2 =    .355   GM/BHP HR
                                                                  BSFC =    .933   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.     WEIGHTED GM/HR          MAN.
MODE        HC-FID   CO     CO2   NO-CL    CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL  HP   VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       259   .020    9.59     45     9.636    3357       9      14      5    .232    2.1       3    1.2     0   13.9
2 16 MG      212   .060   11.88     12    11.961    9934      18     101      3    .077    1.4       8     .3    16   16.0
3 10 MG      124   .030   12.49     12    12.532   14969      15      72      5    .147    2.2      11     .7    44   10.0
4 16 MG      135   .040   11.77     43    11.824    9934      11      68     12    .077     .9       5     .9    16   16.0
5 19 MG       42   .030   10.22     37    10.254    6486       3      38      8    .057     .1       2     .4     0   19.0
6 16 MG      142   .020   11.94     26    11.974    9934      12      34      7    .077     .9       3     .6    16   16.0
7  3 MG      107   .060   13.86     35    13.931   22453      17     195     19    .113    2.0      22    2.1    84    3.0
8 16 MG       65   .040   11.83     34    11.877    9934       5      68      9    .077     .4       5     .7    16   16.0
9 C.T.        36   .040    7.48     13     7.524    3720       2      40      2    .143     .3       6     .3     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .5       3     .3
1 IDLE       259   .020    9.59     45     9.636    3357       9      14      5    .232    2.1       3    1.2     0   13.9
2 16 MG      191   .050   11.98     10    12.049    9934      12      83      3    .077     .9       6     .2    16   16.0
3 10 MG       98   .050   12.71     15    12.770   14969      12     118      6    .147    1.7      17     .9    44   10.0
4 16 MG      118   .040   12.00      9    12.052    9934      10      67      2    .077     .7       5     .2    16   16.0
5 19 MG       21   .050   10.90     20    10.952    6486       1      63      4    .057     .1       4     .2     0   19.0
6 16 MG      136   .050   12.24      6    12.304    9934      11      82      2    .077     .8       6     .1    16   16.0
7  3 MG       90   .050   13.91     28    13.969   22453      15     162     15    .113    1.6      18    1.7    84    3.0
8 16 MG       47   .050   11.84      9    11.895    9934       4      84      2    .077     .3       6     .2    16   16.0
9 C.T.        27   .040    7.56     10     7.603    3720       1      40      2    .143     .2       6     .2     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .4       3     .2
1 IDLE       144   .030   10.89     14    10.934    3357       4      19      1    .232    1.0       4     .3     0   13.9
2 16 MG      129   .060   12.24     12    12.313    9934      10      98      3    .077     .8       8     .2    16   16.0
3 10 MG       93   .060   12.76     18    12.829   14969      11     141      7    .147    1.6      21    1.0    44   10.0
4 16 MG      106   .060   11.98      7    12.051    9934       9     100      2    .077     .7       8     .1    16   16.0
5 19 MG       19   .050   10.37     15    10.422    6486       1      63      3    .057     .1       4     .2     0   19.0
6 16 MG      121   .050   12.16      8    12.222    9934      10      82      2    .077     .8       6     .2    16   16.0
7  3 MG       87   .070   14.07     23    14.149   22453      14     224     12    .113    1.6      25    1.4    84    3.0
8 16 MG       42   .040   11.90     11    11.944    9934       4      67      3    .077     .3       5     .2    16   16.0
9 C.T.        20   .050    7.62      8     7.672    3720       1      49      1    .143     .1       7     .2     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .3       4     .2
1 IDLE       144   .030   10.89     14    10.934    3357       4      19      1    .232    1.0       4     .3     0   13.9
2 16 MG      133   .050   12.24     20    12.303    9934      11      82      5    .077     .8       6     .4    16   16.0
3 10 MG       91   .060   12.76      8    12.829   14969      11     141      3    .147    1.6      21     .5    44   10.0
4 16 MG      108   .060   12.01     11    12.081    9934       9     100      3    .077     .7       8     .2    16   16.0
5 19 MG       25   .050   10.39      8    10.443    6486       2      63      2    .057     .1       4     .1     0   19.0
6 16 MG      129   .060   12.20      6    12.273    9934      10      98      2    .077     .8       8     .1    16   16.0
7  3 MG       83   .090   14.01     16    14.108   22453      13     289      8    .113    1.5      33    1.0    84    3.0
8 16 MG       40   .050   11.76     12    11.814    9934       3      85      3    .077     .3       7     .3    16   16.0
9 C.T.        25   .040    7.68     10     7.722    3720       1      39      2    .143     .2       6     .2     0   22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     .3       4     .1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .4       3     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .3       4     .2
FOUR CYCLE COMPOSITE -               HC- FID  0.35(     .4) + 0.65(     .3) =    .346   GM/BHP HR
                                     CO- NDIR 0.35(    3.1) + 0.65(    4.1) =   3.724   GM/BHP HR
                                     NO2-CL   0.35(     .3) + 0.65(     .2) =    .196   GM/BHP HR
                                                         CORRECTED NO2 =    .199   GM/BHP HR
                                                                  BSFC =    .933   LB/BHP HR
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                         TABLE F-40 MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-1P  TEST 61  RUN 3   R+O CAT-AIR-64          08-03-73      K = .963      HUM = 64.5  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR          MAN.
MODE           HC      CO    CO2      NO     CARBON   CONS.      HC      CO     NO2    FACT.    HC      CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         26    .050  10.01      58    10.088    3357        9      34       6    .232    2.2      8    1.5     0    13.9
2 16 HG        22    .050  12.05      25    12.124    9934       19      83       7    .077    1.5      6     .5    16    16.0
3 10 HG        25    .050  12.48      31    12.557   14969       32     120      12    .147    4.7     18    1.8    49    10.0
4 16 HG        16    .060  11.87      65    11.947    9934       14     101      18    .077    1.1      8    1.4    16    16.0
5 19 HG        12    .060  10.24      60    10.313    6486        8      76      13    .057     .5      4     .7     0    19.0
6 16 HG        19    .050  12.09      61    12.161    9934       17      83      17    .077    1.3      6    1.3    16    16.0
7  3 HG        16    .060  13.66      34    13.737   22453       28     198      18    .113    3.2     22    2.1    89     3.0
8 16 HG        12    .050  11.55      39    11.613    9934       11      86      11    .077     .9      7     .9    16    16.0
9 C.T.         13    .050   7.49      36     7.554    3720        7      50       6    .143    1.0      7     .8     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7      4     .5
1 IDLE         26    .050  10.01      58    10.088    3357        9      34       6    .232    2.2      8    1.5     0    13.9
2 16 HG        18    .050  12.16      25    12.229    9934       16      82       7    .077    1.2      6     .5    16    16.0
3 10 HG        12    .050  12.84      42    12.903   14969       15     117      16    .147    2.2     17    2.4    49    10.0
4 16 HG        11    .050  12.00      38    12.062    9934       10      83      10    .077     .8      6     .8    16    16.0
5 19 HG        10    .060  10.63      14    10.701    6486        7      73       3    .057     .4      4     .2     0    19.0
6 16 HG        18    .060  12.30      25    12.374    9934       16      97       7    .077    1.2      7     .5    16    16.0
7  3 HG        15    .070  13.99      41    14.076   22453       26     226      22    .113    2.9     25    2.5    89     3.0
8 16 HG        18    .060  11.87      31    11.949    9934       16     101       9    .077    1.2      8     .7    16    16.0
9 C.T.         13    .050   7.57      24     7.634    3720        7      49       4    .143    1.0      7     .6     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .6      4     .4
1 IDLE         24    .030  10.99      15    11.046    3357        8      18       2    .232    1.8      4     .4     0    13.9
2 16 HG        28    .040  12.01      28    12.080    9934       25      66       8    .077    1.9      5     .6    16    16.0
3 10 HG        17    .040  12.69      32    12.748   14969       22      95      12    .147    3.2     14    1.8    49    10.0
4 16 HG        18    .030  12.05      27    12.099    9934       16      50       7    .077    1.2      4     .6    16    16.0
5 19 HG         4    .050  10.39      15    10.450    6486        6      63       3    .057     .3      4     .2     0    19.0
6 16 HG        20    .050  12.18      13    12.252    9934       18      82       3    .077    1.3      6     .3    16    16.0
7  3 HG        16    .040  13.89      27    13.947   22453       28     130      14    .113    3.1     15    1.6    89     3.0
8 16 HG        17    .060  12.03      20    12.108    9934       15      99       5    .077    1.2      8     .4    16    16.0
9 C.T.         16    .050   7.61      14     7.677    3720        8      49       3    .143    1.2      7     .4     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7      3     .3
1 IDLE         24    .030  10.99      15    11.046    3357        8      18       2    .232    1.8      4     .4     0    13.9
2 16 HG        24    .050  12.09      22    12.166    9934       21      82       6    .077    1.6      6     .5    16    16.0
3 10 HG        25    .060  12.76      19    12.847   14969       31     141       7    .147    4.6     21    1.1    49    10.0
4 16 HG        19    .040  12.00      33    12.061    9934       17      67       9    .077    1.3      5     .7    16    16.0
5 19 HG        17    .040  10.36      25    10.418    6486       11      50       5    .057     .7      3     .3     0    19.0
6 16 HG        21    .050  12.20      18    12.273    9934       18      82       5    .077    1.4      6     .4    16    16.0
7  3 HG        20    .090  14.16      42    14.272   22453       34     286      22    .113    3.8     32    2.5    89     3.0
8 16 HG        18    .040  11.84      15    11.899    9934       16      67       4    .077    1.2      5     .3    16    16.0
9 C.T.         18    .040   7.65      21     7.709    3720        9      39       3    .143    1.3      6     .5     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .8      4     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .7      4     .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .7      3     .3
FOUR CYCLE COMPOSITE -
                                     HC- NDIR 0.35(     .7) + 0.65(     .7) =     .711   GM/BHP HR
                                     CO- NDIR 0.35(    3.9) + 0.65(    3.5) =    3.628   GM/BHP HR
                                     NO2-NDIR 0.35(     .5) + 0.65(     .3) =     .346   GM/BHP HR
                                                         CORRECTED NO2 =     .333   GM/BHP HR
                                                                  BSFC =     .933   LB/BHP HR


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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE        HC-FID     CO    CO2   NO-CL     CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        287    .050  10.01      46    10.089    3357       10      34       5    .232    2.2      8    1.2     0    13.9
2 16 HG       181    .050  12.05      10    12.118    9934       15      83       3    .077    1.1      6     .2    16    16.0
3 10 HG       102    .050  12.48      14    12.540   14969       12     121       6    .147    1.8     18     .8    49    10.0
4 16 HG       127    .060  11.87      40    11.943    9934       11     101      11    .077     .8      8     .9    16    16.0
5 19 HG        30    .060  10.24      34    10.303    6486        2      76       7    .057     .1      4     .4     0    19.0
6 16 HG       128    .050  12.09      20    12.153    9934       10      83       5    .077     .8      6     .4    16    16.0
7  3 HG        97    .060  13.66      15    13.730   22453       16     198       8    .113    1.8     22     .9    89     3.0
8 16 HG        71    .050  11.55      17    11.607    9934        6      86       5    .077     .5      7     .4    16    16.0
9 C.T.         33    .050   7.49      20     7.543    3720        2      50       3    .143     .2      7     .5     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .4      4     .3
1 IDLE        287    .050  10.01      46    10.089    3357       10      34       5    .232    2.2      8    1.2     0    13.9
2 16 HG       134    .050  12.16      10    12.223    9934       11      82       3    .077     .8      6     .2    16    16.0
3 10 HG        94    .050  12.84      16    12.899   14969       11     117       6    .147    1.6     17     .9    49    10.0
4 16 HG       109    .050  12.00      30    12.061    9934        9      83       8    .077     .7      6     .6    16    16.0
5 19 HG        34    .060  10.63      10    10.693    6486        2      74       2    .057     .1      4     .1     0    19.0
6 16 HG       129    .060  12.30       8    12.373    9934       10      97       2    .077     .8      7     .2    16    16.0
7  3 HG        85    .070  13.99      18    14.068   22453       14     226      10    .113    1.5     26    1.1    89     3.0
8 16 HG        46    .060  11.87      15    11.935    9934        4     101       4    .077     .3      8     .3    16    16.0
9 C.T.         20    .050   7.57      12     7.622    3720        1      49       2    .143     .1      7     .3     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .4      4     .2
1 IDLE        140    .030  10.99      14    11.034    3357        4      18       1    .232    1.0      4     .3     0    13.9
2 16 HG       126    .040  12.01      18    12.063    9934       10      67       5    .077     .8      5     .4    16    16.0
3 10 HG        84    .040  12.69      22    12.738   14969       10      95       9    .147    1.4     14    1.3    49    10.0
4 16 HG       130    .030  12.05      18    12.093    9934       11      50       5    .077     .8      4     .4    16    16.0
5 19 HG        18    .050  10.39      14    10.442    6486        1      63       3    .057     .1      4     .2     0    19.0
6 16 HG       127    .050  12.18       9    12.243    9934       10      82       2    .077     .8      6     .2    16    16.0
7  3 HG        85    .040  13.89      15    13.938   22453       14     130       8    .113    1.6     15     .9    89     3.0
8 16 HG        34    .060  12.03       8    12.093    9934        3     100       2    .077     .2      8     .2    16    16.0
9 C.T.         14    .050   7.61      11     7.661    3720        1      49       2    .143     .1      7     .3     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3      3     .2
1 IDLE        140    .030  10.99      14    11.034    3357        4      18       1    .232    1.0      4     .3     0    13.9
2 16 HG       126    .050  12.09      16    12.153    9934       10      83       4    .077     .8      6     .3    16    16.0
3 10 HG        81    .060  12.76      10    12.828   14969        9     141       4    .147    1.4     21     .6    49    10.0
4 16 HG       104    .040  12.00      21    12.050    9934        9      67       6    .077     .7      5     .4    16    16.0
5 19 HG        14    .040  10.36      15    10.401    6486        1      50       3    .057     .1      3     .2     0    19.0
6 16 HG       124    .050  12.20       9    12.262    9934       10      82       2    .077     .8      6     .2    16    16.0
7  3 HG        81    .090  14.16      25    14.258   22453       13     286      13    .113    1.5     32    1.5    89     3.0
8 16 HG        36    .040  11.84       5    11.884    9934        3      68       1    .077     .2      5     .1    16    16.0
9 C.T.         18    .040   7.65      12     7.692    3720        1      39       2    .143     .1      6     .3     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .3      4     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .4      4     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .3      3     .2
FOUR CYCLE COMPOSITE -
                                     HC- FID  0.35(     .4) + 0.65(     .3) =     .329   GM/BHP HR
                                     CO- NDIR 0.35(    3.9) + 0.65(    3.5) =    3.631   GM/BHP HR
                                     NO2-CL   0.35(     .2) + 0.65(     .2) =     .197   GM/BHP HR
                                                         CORRECTED NO2 =     .190   GM/BHP HR
                                                                  BSFC =     .933   LB/BHP HR
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                        TABLE  F-41MASS EMISSIONS BY NINE-MODE FTP
ENGINE 6-UP  TEST-62  RUN-1   R+O CAT-NO AIR TO R    8-03-73     K =1.002     HUM = 75.6  GR/LB
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             CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
MODE         HC      CO     CO2     NO    CARBON    CONS.     HC      CO     NO2    FACT.    HC      CO    NO2     HP     VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE       14    .030   10.34     48    10.385     3221      5      19       5    .232    1.1      4    1.1      0    14.8
2 16 HG       4    .020   12.14    160    12.164     9934      4      33      43    .077     .3      3    3.3     16    16.0
3 10 HG       4    .040   12.74    365    12.784    15377      5      97     146    .147     .8     14   21.4     51    10.0
4 16 HG       3    .030   11.84    256    11.873     9934      3      51      71    .077     .2      4    5.5     16    16.0
5 19 HG       4    .060   10.76    128    10.824     6350      3      71      25    .057     .1      4    1.4      0    19.0
6 16 HG       4    .010   12.70    192    12.714     9934      3      16      47    .077     .3      1    3.6     16    16.0
7  3 HG       4    .060   13.85    190    13.914    22226      7     194     101    .113     .8     22   11.4     90     3.0
8 16 HG       4    .040   12.12    218    12.164     9934      4      66      59    .077     .3      5    4.6     16    16.0
9 C.T.        8    .050    9.17     81     9.229     4445      4      49      13    .143     .6      7    1.9      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .2      3    2.4
1 IDLE       14    .030   10.34     48    10.385     3221      5      19       5    .232    1.1      4    1.1      0    14.8
2 16 HG       9    .060   12.52    183    12.590     9934      8      96      48    .077     .6      7    3.7     16    16.0
3 10 HG       5    .070   12.85    250    12.925    15377      6     168      99    .147     .9     25   14.5     51    10.0
4 16 HG       4    .070   12.05    178    12.124     9934      4     116      48    .077     .3      9    3.7     16    16.0
5 19 HG       4    .060   10.92    128    10.984     6350      2      70      25    .057     .1      4    1.4      0    19.0
6 16 HG       7    .060   12.21    178    12.278     9934      6      98      48    .077     .5      8    3.7     16    16.0
7  3 HG      12    .070   13.97    205    14.053    22226     20     224     108    .113    2.3     25   12.2     90     3.0
8 16 HG      11    .060   11.89    210    11.962     9934     10     101      58    .077     .8      8    4.5     16    16.0
9 C.T.        7    .060    9.18     72     9.248     4445      4      58      11    .143     .5      8    1.6      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .3      4    2.1
1 IDLE       21    .030   10.80    101    10.853     3221      7      18      10    .232    1.6      4    2.3      0    14.8
2 16 HG      13    .060   12.59    236    12.664     9934     11      95      61    .077     .8      7    4.7     16    16.0
3 10 HG       6    .060   12.92    250    12.986    15377      8     144      98    .147    1.1     21   14.4     51    10.0
4 16 HG       7    .060   12.12    249    12.188     9934      6      99      67    .077     .5      8    5.2     16    16.0
5 19 HG       7    .050   10.88    145    10.938     6350      4      59      28    .057     .3      3    1.6      0    19.0
6 16 HG      14    .010   12.82    180    12.845     9934     12      16      46    .077     .9      1    3.6     16    16.0
7  3 HG       9    .080   13.83    213    13.920    22226     16     258     113    .113    1.8     29   12.8     90     3.0
8 16 HG      14    .070   11.61    220    11.694     9934     13     120      62    .077    1.0      9    4.8     16    16.0
9 C.T.        6    .050    9.03     65     9.086     4445      3      49      11    .143     .5      7    1.5      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .4      4    2.3
1 IDLE       21    .030   10.80    101    10.853     3221      7      18      10    .232    1.6      4    2.3      0    14.8
2 16 HG       1    .050   12.45    220    12.501     9934      1      80      58    .077     .1      6    4.5     16    16.0
3 10 HG       1    .070   12.91    188    12.981    15377      1     167      74    .147     .2     25   10.9     51    10.0
4 16 HG      18    .060   11.98    226    12.059     9934     16     100      62    .077    1.2      8    4.7     16    16.0
5 19 HG       1    .070   10.69    122    10.761     6350      1      83      24    .057     .0      5    1.4      0    19.0
6 16 HG       9    .050   12.09    228    12.150     9934      8      83      62    .077     .6      6    4.8     16    16.0
7  3 HG      12    .050   13.80    223    13.863    22226     21     162     119    .113    2.3     18   13.4     90     3.0
8 16 HG      19    .070   12.31    261    12.398     9934     12     113      69    .077     .9      9    5.3     16    16.0
9 C.T.       10    .060   10.23    147    10.301     4445      5      52      21    .143     .7      7    3.0      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .3      4    2.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------         .3      4    2.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------         .4      4    2.2
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     .3) + 0.65(     .4) =     .319   GM/BHP HR
                                        CO- NDIR 0.35(    3.6) + 0.65(    3.9) =    3.826   GM/BHP HR
                                        NO2-NDIR 0.35(    2.2) + 0.65(    2.2) =    2.235   GM/BHP HR
                                                          CORRECTED NO2 =           2.238   GM/BHP HR
                                                                   BSFC =            .934   LB/BHP HR


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             CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
MODE       HC-FID    CO     CO2  NO-CL    CARBON    CONS.     HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE      161    .030   10.34     20    10.386     3221      5      19       2    .232    1.2      4     .5      0    14.8
2 16 HG     195    .020   12.14    135    12.179     9934     16      33      37    .077    1.2      3    2.8     16    16.0
3 10 HG     193    .040   12.74    350    12.794    15377     17      97     140    .147    2.5     14   20.5     51    10.0
4 16 HG     139    .030   11.84    170    11.884     9934     12      51      47    .077     .9      4    3.6     16    16.0
5 19 HG      57    .060   10.76     40    10.826     6350      3      71       8    .057     .2      4     .4      0    19.0
6 16 HG     154    .010   12.70    145    12.725     9934     12      16      38    .077     .9      1    2.9     16    16.0
7  3 HG     141    .060   13.85    120    13.924    22226     23     193      64    .113    2.5     22    7.2     90     3.0
8 16 HG      58    .040   12.12    135    12.166     9934      5      66      37    .077     .4      5    2.8     16    16.0
9 C.T.       34    .050    9.17     20     9.223     4445      2      49       3    .143     .2      7     .5      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .4      3    1.8
1 IDLE      161    .030   10.34     20    10.386     3221      5      19       2    .232    1.2      4     .5      0    14.8
2 16 HG     152    .060   12.52    170    12.595     9934     12      96      45    .077     .9      7    3.4     16    16.0
3 10 HG     124    .070   12.85     80    12.932    15377     15     168      32    .147    2.2     25    4.6     51    10.0
4 16 HG     115    .070   12.05    160    12.131     9934      9     116      43    .077     .7      9    3.3     16    16.0
5 19 HG      61    .060   10.92     60    10.986     6350      4      70      12    .057     .2      4     .7      0    19.0
6 16 HG     136    .060   12.21    140    12.284     9934     11      98      38    .077     .8      8    2.9     16    16.0
7  3 HG     122    .070   13.97    130    14.052    22226     19     224      68    .113    2.2     25    7.7     90     3.0
8 16 HG      38    .060   11.89    150    11.954     9934      3     101      41    .077     .2      8    3.2     16    16.0
9 C.T.       34    .060    9.18      4     9.243     4445      2      58       1    .143     .2      8     .1      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .4      4    1.2
1 IDLE      199    .030   10.80     65    10.850     3221      6      18       6    .232    1.4      4    1.5      0    14.8
2 16 HG     155    .060   12.59    150    12.666     9934     12      95      39    .077     .9      7    3.0     16    16.0
3 10 HG     119    .060   12.92    140    12.992    15377     14     143      55    .147    2.1     21    8.1     51    10.0
4 16 HG     113    .060   12.12    160    12.191     9934      9      99      43    .077     .7      8    3.3     16    16.0
5 19 HG      58    .050   10.88     65    10.936     6350      3      59      13    .057     .2      3     .7      0    19.0
6 16 HG     128    .010   12.82    140    12.843     9934     10      16      36    .077     .8      1    2.8     16    16.0
7  3 HG     123    .080   13.83    130    13.922    22226     20     258      69    .113    2.2     29    7.8     90     3.0
8 16 HG      92    .070   11.61    150    11.684     9934      4     120      42    .077     .3      9    3.3     16    16.0
9 C.T.       30    .050    9.03      6     9.083     4445      1      49       1    .143     .2      7     .1      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .4      4    1.4
1 IDLE      199    .030   10.80     65    10.850     3221      6      18       6    .232    1.4      4    1.5      0    14.8
2 16 HG     158    .050   12.45    135    12.515     9934     12      80      36    .077     .9      6    2.7     16    16.0
3 10 HG     119    .070   12.91     73    12.992    15377     14     167      29    .147    2.1     25    4.2     51    10.0
4 16 HG     113    .060   11.98    135    12.051     9934      9     100      37    .077     .7      8    2.8     16    16.0
5 19 HG      48    .070   10.69     30    10.765     6350      3      83       6    .057     .2      5     .3      0    19.0
6 16 HG     136    .050   12.09    133    12.154     9934     11      83      36    .077     .9      6    2.8     16    16.0
7  3 HG     116    .050   13.80    123    13.862    22226     19     162      65    .113    2.1     18    7.4     90     3.0
8 16 HG      90    .070   12.31    150    12.384     9934      7     113      40    .077     .5      9    3.1     16    16.0
9 C.T.       42    .060   10.23    105    10.294     4445      2      52      15    .143     .3      7    2.2      0    20.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------         .4      4    1.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------         .4      4    1.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------         .4      4    1.3
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     .4) + 0.65(     .4) =     .396   GM/BHP HR
                                        CO- NDIR 0.35(    3.6) + 0.65(    3.9) =    3.826   GM/BHP HR
                                        NO2-CL   0.35(    1.5) + 0.65(    1.3) =    1.359   GM/BHP HR
                                                          CORRECTED NO2 =           1.355   GM/BHP HR
                                                                   BSFC =            .934   LB/BHP HR
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                          TABLE F-42 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-00  TEST 52  RUN-1   1973 STANDARD ENGINE  07-17-73      K =1.098      HUM =118.8  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR        WT.      WEIGHTED GM/HR               MAN.
MODE             HC       CO     CO2      NO   CARBON   CONS.      HC      CO     NO2   FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE           82     .720   12.84     110   13.649    3084      20     329       8   .232     4.6       76     1.9     0    16.5
2 30 PCT T       68    1.700   13.24     720   15.013   11930      58    2729     190   .077     4.5      210    14.6    35    19.5
3 60 PCT T       62    1.440   13.24    1967   14.747   17282      78    3409     765   .147    11.5      501   112.5    71     8.1
4 30 PCT T       63    1.720   13.25     748   15.038   11930      54    2756     197   .077     4.2      212    15.2    35    19.5
5 10 PCT T       47    1.570   13.38     311   15.001    8256      28    1745      57   .057     1.6       99     3.2    12    18.0
6 30 PCT T       63    1.670   13.25     784   14.988   11930      54    2685     207   .077     4.2      207    16.0    35    19.5
7 90 PCT T       61    1.790   12.88    2264   14.736   23905     107    5866    1219   .113    12.1      663   137.8   107     2.0
8 30 PCT T       67    1.900   13.13     713   15.102   11930      57    3032     187   .077     4.4      233    14.4    35    19.5
9 C.T.         2163    1.700    9.82      85   13.856    3266     551     809       7   .143    78.7      116     1.0     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.7       68     9.3
1 IDLE           82     .720   12.84     110   13.649    3084      20     329       8   .232     4.6       76     1.9     0    16.5
2 30 PCT T       71    1.710   13.22     735   15.007   11930      61    2746     194   .077     4.7      211    14.9    35    19.5
3 60 PCT T       60     .830   13.43    2046   14.325   17282      78    2023     820   .147    11.5      297   120.5    71     8.1
4 30 PCT T       67    1.850   13.17     687   15.092   11930      57    2954     180   .077     4.4      227    13.9    35    19.5
5 10 PCT T       52    1.610   13.28     290   14.946    8256      31    1796      53   .057     1.8      102     3.0    12    18.0
6 30 PCT T       65    1.820   13.18     705   15.070   11930      56    2910     185   .077     4.3      224    14.2    35    19.5
7 90 PCT T       88    2.930   12.46    1979   15.485   23905     147    9137    1014   .113    16.6     1032   114.6   107     2.0
8 30 PCT T       71    1.940   13.08     708   15.097   11930      61    3097     186   .077     4.7      238    14.3    35    19.5
9 C.T.         2148    1.800    9.94      83   14.060    3266     539     845       6   .143    77.1      121      .9     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.8       74     8.7
1 IDLE           75     .910   13.17     107   14.161    3084      18     400       8   .232     4.1       93     1.8     0    16.5
2 30 PCT T       71    1.820   13.12     701   15.017   11930      61    2921     185   .077     4.7      225    14.2    35    19.5
3 60 PCT T       60     .790   13.45    2104   14.305   17282      78    1928     844   .147    11.5      283   124.1    71     8.1
4 30 PCT T       65    1.790   13.22     723   15.080   11930      56    2860     190   .077     4.3      220    14.6    35    19.5
5 10 PCT T       50    1.640   13.27     262   14.964    8256      30    1828      48   .057     1.7      104     2.7    12    18.0
6 30 PCT T       68    1.830   13.18     729   15.083   11930      58    2924     191   .077     4.5      225    14.7    35    19.5
7 90 PCT T       48    1.240   13.11    2406   14.402   23905      86    4158    1326   .113     9.7      470   149.8   107     2.0
8 30 PCT T       66    1.960   13.06     704   15.091   11930      56    3130     185   .077     4.3      241    14.2    35    19.5
9 C.T.         2140    1.790    9.91      80   14.011    3266     539     843       6   .143    77.0      121      .9     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.6       58     9.9
1 IDLE           75     .910   13.17     107   14.161    3084      18     400       8   .232     4.1       93     1.8     0    16.5
2 30 PCT T       68    1.790   13.13     644   14.993   11930      58    2877     170   .077     4.5      222    13.1    35    19.5
3 60 PCT T       56     .760   13.42    2126   14.240   17282      73    1863     857   .147    10.8      274   125.9    71     8.1
4 30 PCT T       64    1.810   13.24     702   15.119   11930      55    2885     184   .077     4.2      222    14.2    35    19.5
5 10 PCT T       49    1.680   13.32     289   15.053    8256      29    1861      53   .057     1.7      106     3.0    12    18.0
6 30 PCT T       64    1.820   13.18     737   15.069   11930      55    2911     194   .077     4.2      224    14.9    35    19.5
7 90 PCT T       88    2.870   12.49    2018   15.455   23905     147    8967    1036   .113    16.6     1013   117.1   107     2.0
8 30 PCT T       69    1.970   13.12     720   15.165   11930      59    3131     188   .077     4.5      241    14.5    35    19.5
9 C.T.         2173    1.750    9.92     102   14.017    3266     547     824       8   .143    78.2      118     1.1     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.8       73     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   3.7       71     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   3.7       66     9.4
FOUR CYCLE COMPOSITE -
                                   HC- NDIR 0.35(    3.7) + 0.65(    3.7) =   3.686   GM/BHP HR
                                   CO- NDIR 0.35(   70.8) + 0.65(   65.7) =  67.486   GM/BHP HR
                                   NO2-NDIR 0.35(    9.0) + 0.65(    9.4) =   9.259   GM/BHP HR
                                                        CORRECTED NO2 =  10.152   GM/BHP HR
                                                                 BSFC =    .681   LB/BHP HR


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                 CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR        WT.      WEIGHTED GM/HR               MAN.
MODE         HC-FID       CO     CO2   NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID      CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE         1056     .720   12.84      70   13.666    3084      24     328       5   .232     5.5       76     1.2     0    16.5
2 30 PCT T     1836    1.700   13.24     640   15.124   11930     145    2709     168   .077    11.2      209    12.9    35    19.5
3 60 PCT T     1435    1.440   13.24    1888   14.823   17282     167    3391     731   .147    24.6      499   107.4    71     8.1
4 30 PCT T     1708    1.720   13.25     662   15.141   11930     135    2738     173   .077    10.4      211    13.3    35    19.5
5 10 PCT T     1267    1.570   13.38     250   15.077    8256      69    1737      45   .057     4.0       99     2.6    12    18.0
6 30 PCT T     1735    1.670   13.25     675   15.094   11930     137    2666     177   .077    10.6      205    13.6    35    19.5
7 90 PCT T     1249    1.790   12.88    2050   14.795   23905     202    5842    1100   .113    22.8      660   124.3   107     2.0
8 30 PCT T     1908    1.900   13.13     525   15.221   11930     150    3008     137   .077    11.5      232    10.5    35    19.5
9 C.T.        26335    1.700    9.82      55   14.154    3266     608     792       4   .143    86.9      113      .6     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   5.5       67     8.4
1 IDLE         1056     .720   12.84      70   13.666    3084      24     328       5   .232     5.5       76     1.2     0    16.5
2 30 PCT T     2020    1.710   13.22     620   15.132   11930     159    2723     162   .077    12.3      210    12.5    35    19.5
3 60 PCT T     1443     .830   13.43    1975   14.404   17282     173    2012     787   .147    25.5      296   115.6    71     8.1
4 30 PCT T     1923    1.850   13.17     625   15.212   11930     151    2931     163   .077    11.6      226    12.5    35    19.5
5 10 PCT T     1479    1.610   13.28     250   15.038    8256      81    1785      46   .057     4.6      102     2.6    12    18.0
6 30 PCT T     1907    1.820   13.18     663   15.191   11930     150    2887     173   .077    11.5      222    13.3    35    19.5
7 90 PCT T     1999    2.930   12.46    1875   15.590   23905     307    9075     955   .113    34.6     1026   107.9   107     2.0
8 30 PCT T     1979    1.940   13.08     650   15.218   11930     155    3072     169   .077    11.9      237    13.0    35    19.5
9 C.T.        25941    1.800    9.94      40   14.334    3266     591     828       3   .143    84.5      118      .4     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   5.9       73     8.2
1 IDLE         1469     .910   13.17      75   14.227    3084      32     398       5   .232     7.4       92     1.3     0    16.5
2 30 PCT T     2077    1.820   13.12     610   15.148   11930     164    2895     160   .077    12.6      223    12.3    35    19.5
3 60 PCT T     1429     .790   13.45    1975   14.383   17282     172    1917     788   .147    25.2      282   115.8    71     8.1
4 30 PCT T     1908    1.790   13.22     675   15.201   11930     150    2838     176   .077    11.5      219    13.5    35    19.5
5 10 PCT T     1451    1.640   13.27     225   15.055    8256      80    1817      41   .057     4.5      104     2.3    12    18.0
6 30 PCT T     2008    1.830   13.18     675   15.211   11930     157    2899     176   .077    12.1      223    13.5    35    19.5
7 90 PCT T     1969    1.240   13.11    2287   14.547   23905     324    4116    1248   .113    36.6      465   141.0   107     2.0
8 30 PCT T     1908    1.960   13.06     650   15.211   11930     150    3105     169   .077    11.5      239    13.0    35    19.5
9 C.T.        26597    1.790    9.91      50   14.360    3266     605     822       4   .143    86.5      118      .5     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   6.1       57     9.2
1 IDLE         1469     .910   13.17      75   14.227    3084      32     398       5   .232     7.4       92     1.3     0    16.5
2 30 PCT T     2048    1.790   13.13     580   15.125   11930     162    2852     152   .077    12.4      220    11.7    35    19.5
3 60 PCT T     1414     .760   13.42    1975   14.321   17282     171    1853     791   .147    25.1      272   116.3    71     8.1
4 30 PCT T     1937    1.810   13.24     650   15.244   11930     152    2861     169   .077    11.7      220    13.0    35    19.5
5 10 PCT T     1537    1.680   13.32     250   15.154    8256      84    1849      45   .057     4.8      105     2.6    12    18.0
6 30 PCT T     1907    1.820   13.18     650   15.191   11930     150    2887     169   .077    11.5      222    13.0    35    19.5
7 90 PCT T     2027    2.870   12.49    1875   15.563   23905     311    8906     956   .113    35.2     1006   108.0   107     2.0
8 30 PCT T     1937    1.970   13.12     650   15.284   11930     151    3106     168   .077    11.6      239    13.0    35    19.5
9 C.T.        26369    1.750    9.92      45   14.307    3266     602     807       3   .143    86.1      115      .5     0    23.0
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   6.0       73     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   5.7       70     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   6.0       65     8.7
FOUR CYCLE COMPOSITE -
                                   HC- FID  0.35(    5.7) + 0.65(    6.0) =   5.922   GM/BHP HR
                                   CO- NDIR 0.35(   70.4) + 0.65(   65.1) =  66.962   GM/BHP HR
                                   NO2-CL   0.35(    8.3) + 0.65(    8.7) =   8.522   GM/BHP HR
                                                        CORRECTED NO2 =   9.354   GM/BHP HR
                                                                 BSFC =    .681   LB/BHP HR
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                        TABLE F-43 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-00  TEST-52  RUN-2   1973 STANDARD ENGINE  07-17-73      K =1.092      HUM =114.4  GR/LB
-----------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE             HC      CO      CO2     NO   CARBON   CONS.      HC      CO    NO2  FACT.   HC       CO     NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE           94    .630   13.24     74   13.972    3084       22     281      5  .232    5.2      65     1.3     0   16.5
2 30 PCT T       71   1.720   13.48    687   15.277   11930       60    2713    178  .077    4.6     209    13.7    35   14.5
3 60 PCT T       70    .640   13.88   2015   14.596   17282       90    1531    792  .147   13.2     225   116.4    71    8.1
4 30 PCT T       72   2.010   13.48    676   15.568   11930       60    3111    172  .077    4.6     240    13.2    35   14.5
5 10 PCT T       55   1.680   13.70    264   15.434    8256       32    1815     47  .057    1.8     103     2.7    12   18.0
6 30 PCT T       70   2.040   13.50    676   15.616   11930       58    3148    171  .077    4.4     242    13.2    35   14.5
7 90 PCT T       89   3.320   13.02   1957   16.436   23905      140    9754    945  .113   15.8    1102   106.8   107    2.0
8 30 PCT T       70   1.920   13.61    669   15.606   11930       58    2965    170  .077    4.5     228    13.1    35   14.5
9 C.T.         1931   2.000   10.15     56   14.235    3266      478     927      4  .143   68.4     133      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.6      74     8.2
1 IDLE           94    .630   13.24     74   13.972    3084       22     281      5  .232    5.2      65     1.3     0   16.5
2 30 PCT T       78   2.190   13.52    558   15.794   11930       64    3341    140  .077    4.9     257    10.8    35   14.5
3 60 PCT T       65    .630   14.04   1962   14.740   17282       82    1492    764  .147   12.1     219   112.3    71    8.1
4 30 PCT T       70   1.870   12.68    659   14.626   11930       62    3081    179  .077    4.7     237    13.7    35   14.5
5 10 PCT T       53   1.480   13.85    241   15.387    8256       31    1604     43  .057    1.8      91     2.4    12   18.0
6 30 PCT T       72   1.910   13.64    674   15.628   11930       59    2948    171  .077    4.6     227    13.2    35   14.5
7 90 PCT T       94   3.730   12.84   1944   16.722   23905      145   10771    925  .113   16.4    1217   104.5   107    2.0
8 30 PCT T       71   1.950   13.57    664   15.597   11930       59    3013    166  .077    4.5     232    12.8    35   14.5
9 C.T.         1800   1.990   10.25     52   14.134    3266      449     906      4  .143   64.2     129      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.5      78     7.9
1 IDLE          103    .850   13.46     77   14.481    3084       24     367      5  .232    5.5      85     1.3     0   16.5
2 30 PCT T       78   2.040   13.41    644   15.534   11930       65    3165    165  .077    5.0     244    12.7    35   14.5
3 60 PCT T       63    .580   13.80   1997   14.448   17282       81    1401    793  .147   12.0     206   116.6    71    8.1
4 30 PCT T       71   1.990   13.47    665   15.487   11930       59    3019    170  .077    4.5     232    13.1    35   14.5
5 10 PCT T       55   1.660   13.61    241   15.329    8256       32    1806     43  .057    1.8     103     2.5    12   18.0
6 30 PCT T       70   2.040   13.46    658   15.576   11930       58    3156    167  .077    4.5     243    12.9    35   14.5
7 90 PCT T       91   3.570   12.90   2007   16.568   23905      142   10405    961  .113   16.0    1176   108.6   107    2.0
8 30 PCT T       73   2.190   13.32    645   15.589   11930       60    3385    164  .077    4.6     261    12.6    35   14.5
9 C.T.         2021   1.900   10.13     52   14.213    3266      502     882      4  .143   71.7     126      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.7      78     8.2
1 IDLE          103    .850   13.46     77   14.421    3084       24     367      5  .232    5.5      85     1.3     0   16.5
2 30 PCT T       74   2.010   13.36    595   15.455   11930       66    3134    152  .077    5.1     241    11.7    35   14.5
3 60 PCT T       65    .620   13.79   1972   14.490   17282       84    1495    781  .147   12.3     220   114.9    71    8.1
4 30 PCT T       71   1.980   13.38    664   15.437   11930       59    3094    170  .077    4.6     238    13.1    35   14.5
5 10 PCT T       56   1.640   13.50    250   15.200    8256       33    1799     45  .057    1.9     103     2.6    12   18.0
6 30 PCT T       70   2.050   13.33    670   15.456   11930       58    3196    172  .077    4.5     246    13.2    35   14.5
7 90 PCT T       92   3.830   12.65   1890   16.579   23905      143   11155    905  .113   16.2    1261   102.2   107    2.0
8 30 PCT T       74   2.020   13.21    662   15.310   11930       62    3180    171  .077    4.8     245    13.2    35   14.5
9 C.T.         1884   1.980    9.99     55   14.005    3266      475     933      4  .143   67.9     133      .6     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     3.6      81     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     3.5      76     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     3.6      80     8.1
FOUR CYCLE COMPOSITE -                   HC- NDIR 0.35(    3.5) + 0.65(    3.6) =    3.591   GM/BHP HR
                                         CO- NDIR 0.35(   76.3) + 0.65(   79.6) =   78.451   GM/BHP HR
                                         NO2-NDIR 0.35(    8.1) + 0.65(    8.1) =    8.084   GM/BHP HR
                                                              CORRECTED NO2 =    8.825   GM/BHP HR
                                                                       BSFC =     .681   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID     CO     CO2  NO-CL   CARBON   CONS.      HC      CO    NO2  FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         1651    .630   13.24     70   14.035    3084       36     280      5  .232    8.4      65     1.2     0   16.5
2 30 PCT T     1783   1.720   13.48    635   15.378   11930      138    2695    164  .077   10.6     208    12.6    35   14.5
3 60 PCT T     1475    .640   13.88   1950   14.667   17282      174    1523    763  .147   25.5     224   112.1    71    8.1
4 30 PCT T     1873   2.010   13.48    650   15.677   11930      143    3090    164  .077   11.0     238    12.6    35   14.5
5 10 PCT T     1500   1.680   13.70    238   15.530    8256       80    1804     42  .057    4.5     103     2.4    12   18.0
6 30 PCT T     1801   2.040   13.50    650   15.780   11930      137    3127    164  .077   10.5     241    12.6    35   14.5
7 90 PCT T     1857   3.320   13.02   2000   16.586   23905      269    9701    961  .113   30.4    1096   108.5   107    2.0
8 30 PCT T     1715   1.920   13.61    638   15.702   11930      130    2947    161  .077   10.0     227    12.4    35   14.5
9 C.T.        23805   2.000   10.15     25   14.531    3266      535     908      2  .143   76.5     130      .3     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     5.5      74     8.0
1 IDLE         1651    .630   13.24     70   14.035    3084       36     280      5  .232    8.4      65     1.2     0   16.5
2 30 PCT T     2062   2.190   13.52    530   15.916   11930      155    3316    132  .077   11.9     255    10.2    35   14.5
3 60 PCT T     1448    .630   14.04   1950   14.818   17282      169    1485    755  .147   24.8     218   111.0    71    8.1
4 30 PCT T     1844   1.870   12.68    650   14.734   11930      149    3058    175  .077   11.5     236    13.5    35   14.5
5 10 PCT T     1370   1.480   13.85    225   15.467    8256       73    1596     40  .057    4.2      91     2.3    12   18.0
6 30 PCT T     1859   1.910   13.64    650   15.736   11930      141    2925    164  .077   10.9     225    12.6    35   14.5
7 90 PCT T     1933   3.730   12.84   1900   16.813   23905      275   10713    897  .113   31.0    1211   101.3   107    2.0
8 30 PCT T     1858   1.950   13.57    650   15.706   11930      141    2992    164  .077   10.9     230    12.6    35   14.5
9 C.T.        23813   1.990   10.25     32   14.571    3266      534     878      2  .143   76.3     126      .3     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     5.5      78     7.7
1 IDLE         2123    .850   13.46     80   14.588    3084       45     365      6  .232   10.5      85     1.3     0   16.5
2 30 PCT T     2086   2.040   13.41    625   15.689   11930      159    3140    158  .077   12.2     242    12.2    35   14.5
3 60 PCT T     1416    .580   13.80   1975   14.582   17282      169    1394    780  .147   24.8     205   114.7    71    8.1
4 30 PCT T     1900   1.990   13.47    663   15.600   11930      145    2997    168  .077   11.2     231    13.0    35   14.5
5 10 PCT T     1455   1.660   13.61    239   15.416    8256       78    1796     42  .057    4.4     102     2.4    12   18.0
6 30 PCT T     1887   2.040   13.46    625   15.689   11930      143    3134    158  .077   11.0     241    12.1    35   14.5
7 90 PCT T     1989   3.570   12.90   1900   16.666   23905      281   10344    905  .113   31.8    1169   102.2   107    2.0
8 30 PCT T     1944   2.190   13.32    625   15.709   11930      148    3361    158  .077   11.4     259    12.1    35   14.5
9 C.T.        23559   1.900   10.13     30   14.386    3266      535     871      2  .143   76.5     125      .3     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     5.7      78     7.9
1 IDLE         2123    .850   13.46     80   14.522    3084       45     365      6  .232   10.5      85     1.3     0   16.5
2 30 PCT T     2071   2.010   13.36    520   15.577   11930      159    3110    132  .077   12.2     239    10.2    35   14.5
3 60 PCT T     1488    .620   13.79   1962   14.559   17282      177    1487    773  .147   26.0     219   113.7    71    8.1
4 30 PCT T     1913   1.980   13.38    638   15.551   11930      147    3068    162  .077   11.3     236    12.5    35   14.5
5 10 PCT T     1482   1.640   13.50    245   15.288    8256       80    1789     44  .057    4.6     102     2.5    12   18.0
6 30 PCT T     1885   2.050   13.33    638   15.568   11930      144    3173    162  .077   11.1     244    12.5    35   14.5
7 90 PCT T     1988   3.830   12.65   1838   16.679   23905      285   11089    875  .113   32.2    1253    98.8   107    2.0
8 30 PCT T     1911   2.020   13.21    638   15.421   11930      148    3157    164  .077   11.4     243    12.6    35   14.5
9 C.T.        23992   1.980    9.99     27   14.369    3266      545     909      2  .143   78.0     130      .3     0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     5.8      80     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     5.5      76     7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     5.7      79     7.8
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(    5.5) + 0.65(    5.7) =    5.643   GM/BHP HR
                                         CO- NDIR 0.35(   75.8) + 0.65(   79.0) =   77.902   GM/BHP HR
                                         NO2-CL   0.35(    7.9) + 0.65(    7.8) =    7.840   GM/BHP HR
                                                              CORRECTED NO2 =    8.558   GM/BHP HR
                                                                       BSFC =     .681   LB/BHP HR
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                   TABLE F-44  MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-00  TEST-52  RUN-3   1973 STANDARD ENGINE  07-17-73      K =1.090      HUM =113.9  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR               MAN.
MODE             HC       CO     CO2      NO   CARBON   CONS.      HC       CO      NO2     FACT.   HC         CO     NO2     HP    VAC.
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1 IDLE           44     .470   12.40      91   12.918    3084      11      227       7     .232     2.6        53     1.7      0   16.5
2 30 PCT T       71    1.710   12.93     737   14.717   11930      62     2800     198     .077     4.8       216    15.2     35   14.5
3 60 PCT T       61     .820   13.22    2054   14.106   17282      81     2029     835     .147    11.9       298   122.8     71    8.1
4 30 PCT T       67    1.830   12.99     818   14.892   11930      58     2961     218     .077     4.5       228    16.8     35   14.5
5 10 PCT T       54    1.580   13.13     321   14.768    8256      33     1784      60     .057     1.9       102     3.4     12   18.0
6 30 PCT T       67    1.770   12.99     729   14.832   11930      58     2876     195     .077     4.5       221    15.0     35   14.5
7 90 PCT T       98    3.340   12.01    1856   15.456   23905     164    10435     953     .113    18.5      1179   107.7    107    2.0
8 30 PCT T       71    2.110   12.87     745   15.057   11930      61     3377     196     .077     4.7       260    15.1     35   14.5
9 C.T.         2160    1.590    9.70      62   13.623    3266     559      770       5     .143    80.0       110      .7      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      3.9        78     8.7
1 IDLE           44     .470   12.40      91   12.918    3084      11      227       7     .232     2.6        53     1.7      0   16.5
2 30 PCT T       73    1.800   13.02     736   14.899   11930      63     2911     196     .077     4.9       224    15.1     35   14.5
3 60 PCT T       61     .820   13.41    2083   14.296   17282      80     2002     836     .147    11.7       294   122.9     71    8.1
4 30 PCT T       70    1.950   12.97     683   14.996   11930      60     3134     180     .077     4.6       241    13.9     35   14.5
5 10 PCT T       54    1.720   13.18     264   14.958    8256      32     1918      48     .057     1.8       109     2.8     12   18.0
6 30 PCT T       71    1.930   12.93     696   14.937   11930      61     3114     185     .077     4.7       240    14.2     35   14.5
7 90 PCT T       96    3.170   12.12    1809   15.394   23905     161     9944     930     .113    18.2      1124   105.1    107    2.0
8 30 PCT T       76    2.120   12.90     691   15.102   11930      65     3383     181     .077     5.0       260    14.0     35   14.5
9 C.T.         2133    1.690    9.76      74   13.759    3266     547      811       6     .143    78.2       116      .8      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      3.9        78     8.5
1 IDLE           53     .770   13.06      89   13.887    3084      13      345       7     .232     2.9        80     1.6      0   16.5
2 30 PCT T       75    1.990   12.86     649   14.931   11930      65     3212     172     .077     5.0       247    13.3     35   14.5
3 60 PCT T       64     .890   13.36    1958   14.319   17282      83     2170     785     .147    12.3       319   115.3     71    8.1
4 30 PCT T       71    2.030   12.84     679   14.947   11930      61     3273     179     .077     4.7       252    13.8     35   14.5
5 10 PCT T       57    1.790   13.08     263   14.932    8256      34     1999      48     .057     1.9       114     2.8     12   18.0
6 30 PCT T       72    2.090   12.84     658   15.008   11930      62     3356     174     .077     4.8       258    13.4     35   14.5
7 90 PCT T       99    3.150   12.14    1790   15.397   23905     166     9879     923     .113    18.8      1116   104.3    107    2.0
8 30 PCT T       72    2.140   12.88     659   15.098   11930      61     3416     174     .077     4.7       263    13.4     35   14.5
9 C.T.         2108    1.600    9.79      64   13.667    3266     544      772       6     .143    77.8       110      .8      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      3.9        81     8.1
1 IDLE           53     .770   13.06      89   13.887    3084      13      345       7     .232     2.9        80     1.5      0   16.5
2 30 PCT T       75    2.050   12.75     608   14.881   11930      65     3320     162     .077     5.0       256    12.5     35   14.5
3 60 PCT T       62     .890   13.23    1903   14.187   17282      82     2074     772     .147    12.0       305   113.5     71    8.1
4 30 PCT T       71    2.060   12.79     629   14.927   11930      61     3326     166     .077     4.7       256    12.7     35   14.5
5 10 PCT T       56    1.780   12.92     267   14.760    8256      34     2011      50     .057     1.9       115     2.8     12   18.0
6 30 PCT T       72    1.960   12.73     656   14.768   11930      63     3198     176     .077     4.8       246    13.5     35   14.5
7 90 PCT T       92    2.790   12.16    1832   15.049   23905     158     8952     966     .113    17.8      1012   109.2    107    2.0
8 30 PCT T       72    2.070   12.64     625   14.788   11930      63     3373     167     .077     4.8       260    12.9     35   14.5
9 C.T.         2221    1.540    9.64      64   13.579    3266     577      748       6     .143    82.5       107      .8      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      4.0        77     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------      3.9        78     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------      3.9        79     8.2
FOUR CYCLE COMPOSITE -                     HC- NDIR 0.35(     3.9) + 0.65(     3.9) =    3.915   GM/BHP HR
                                           CO- NDIR 0.35(    77.9) + 0.65(    78.9) =   78.505   GM/BHP HR
                                           NO2-NDIR 0.35(     8.6) + 0.65(     8.2) =    8.310   GM/BHP HR
                                                                    CORRECTED NO2 =    9.060   GM/BHP HR
                                                                             BSFC =     .681   LB/BHP HR


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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR               MAN.
MODE          HC-FID      CO     CO2   NO-CL   CARBON   CONS.      HC       CO      NO2     FACT.  HC-FID       CO  NO2-CL     HP    VAC.
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1 IDLE          783     .470   12.40      75   12.948    3084      19      226       6     .232     4.3        52     1.4      0   16.5
2 30 PCT T     1817    1.710   12.93     700   14.822   11930     146     2840     187     .077    11.3       219    14.4     35   14.5
3 60 PCT T     1314     .820   13.22    2006   14.171   17282     160     2020     812     .147    23.6       297   119.4     71    8.1
4 30 PCT T     1734    1.830   12.99     750   14.993   11930     138     2941     198     .077    10.6       226    15.3     35   14.5
5 10 PCT T     1306    1.580   13.13     306   14.841    8256      73     1776      57     .057     4.1       101     3.2     12   18.0
6 30 PCT T     1733    1.770   12.99     688   14.933   11930     138     2856     182     .077    10.7       220    14.1     35   14.5
7 90 PCT T     2027    3.340   12.01    1825   15.553   23905     312    10370     931     .113    35.2      1172   105.2    107    2.0
8 30 PCT T     1792    2.110   12.87     750   15.159   11930     137     3355     196     .077    10.6       258    15.1     35   14.5
9 C.T.        23414    1.590    9.70      30   13.631    3266     561      770       2     .143    80.2       110      .3      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      5.6        77     8.4
1 IDLE          783     .470   12.40      75   12.948    3084      19      226       6     .232     4.3        52     1.4      0   16.5
2 30 PCT T     1905    1.800   13.02     725   15.010   11930     151     2890     191     .077    11.7       223    14.7     35   14.5
3 60 PCT T     1401     .820   13.41    2063   14.370   17282     168     1992     824     .147    24.8       293   121.1     71    8.1
4 30 PCT T     1836    1.950   12.97     663   15.104   11930     145     3111     179     .077    11.2       240    13.9     35   14.5
5 10 PCT T     1422    1.720   13.18     238   15.042    8256      78     1907      43     .057     4.4       109     2.5     12   18.0
6 30 PCT T     1848    1.930   12.93     650   15.045   11930     147     3091     171     .077    11.3       238    13.2     35   14.5
7 90 PCT T     2012    3.170   12.12    1788   15.491   23905     311     9881     916     .113    35.1      1117   103.5    107    2.0
8 30 PCT T     1908    2.120   12.90     675   15.211   11930     150     3359     176     .077    11.5       259    13.5     35   14.5
9 C.T.        23888    1.690    9.76      30   13.839    3266     564      806       2     .143    80.6       115      .3      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      5.7        77     8.3
1 IDLE         1199     .770   13.06      75   13.950    3084      27      344       6     .232     6.1        80     1.3      0   16.5
2 30 PCT T     2019    1.990   12.86     605   15.052   11930     160     3186     159     .077    12.3       245    12.3     35   14.5
3 60 PCT T     1506     .890   13.36    1875   14.400   17282     180     2158     747     .147    26.5       317   109.8     71    8.1
4 30 PCT T     1892    2.030   12.84     650   15.059   11930     150     3249     171     .077    11.5       250    13.2     35   14.5
5 10 PCT T     1593    1.790   13.08     238   15.029    8256      87     1986      43     .057     5.0       113     2.5     12   18.0
6 30 PCT T     1878    2.090   12.84     613   15.118   11930     148     3332     161     .077    11.4       257    12.4     35   14.5
7 90 PCT T     1998    3.150   12.14    1750   15.490   23905     308     9820     897     .113    34.8      1110   101.3    107    2.0
8 30 PCT T     1800    2.140   12.88     625   15.200   11930     141     3393     163     .077    10.9       261    12.5     35   14.5
9 C.T.        22991    1.600    9.79      30   13.689    3266     549      771       2     .143    78.4       110      .3      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      5.8        80     7.8
1 IDLE         1199     .770   13.06      75   13.950    3084      27      344       6     .232     6.1        80     1.3      0   16.5
2 30 PCT T     1904    2.050   12.75     575   14.990   11930     152     3296     152     .077    11.7       254    11.7     35   14.5
3 60 PCT T     1913     .890   13.23    1850   14.311   17282     172     2063     747     .147    25.3       303   109.8     71    8.1
4 30 PCT T     1848    2.060   12.79     600   15.035   11930     147     3302     158     .077    11.3       254    12.2     35   14.5
5 10 PCT T     1971    1.780   12.92     250   14.897    8256      82     1999      46     .057     4.7       114     2.6     12   18.0
6 30 PCT T     1767    1.960   12.73     625   14.867   11930     142     3177     167     .077    10.9       245    12.8     35   14.5
7 90 PCT T     1878    2.790   12.16    1813   15.138   23905     297     8900     951     .113    33.5      1006   107.4    107    2.0
8 30 PCT T     1818    2.070   12.64     600   14.892   11930     146     3350     160     .077    11.2       258    12.3     35   14.5
9 C.T.        22951    1.540    9.64      25   13.475    3266     556      754       2     .143    79.5       108      .3      0   23.0
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------      5.7        77     7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------      5.6        77     8.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------      5.7        78     7.8
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(     5.6) + 0.65(     5.7) =    5.687   GM/BHP HR
                                           CO- NDIR 0.35(    77.4) + 0.65(    78.4) =   78.032   GM/BHP HR
                                           NO2-CL   0.35(     8.4) + 0.65(     7.8) =    8.015   GM/BHP HR
                                                                    CORRECTED NO2 =    8.738   GM/BHP HR
                                                                             BSFC =     .681   LB/BHP HR
                   TABLE F-45  MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST-66  RUN-4   PARAMETRIC BASELINE   08-09-73      K =1.070      HUM =101.8  GM/LB
---------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR         WT.        WEIGHTED GM/HR          MAN.
MODE            HC     CO     CO2     NO   CARBON   CONS.      HC      CO     NO2     FACT.    HC       CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE         170  1.320  12.84    110  14.344    3357      43     624       9     .232    10.0     145     2.0    0   14.4
2 30 PCT T      55   .270  13.76    719  14.089   11521      48     446     195     .077     3.7      34    15.0   31   13.2
3 60 PCT T      43   .200  13.46   1562  13.706   16556      56     488     626     .147     8.2      72    92.1   63    8.2
4 30 PCT T      44   .310  13.91    730  14.268   11521      38     506     196     .077     3.0      39    15.1   31   13.2
5 10 PCT T      42   .270  14.09    243  14.406    8346      26     316      47     .057     1.5      18     2.7   10   16.7
6 30 PCT T      44   .250  13.99    733  14.288   11521      38     407     196     .077     3.0      31    15.1   31   13.2
7 90 PCT T      61   .660  13.75   2502  14.476   21954     100    2022    1260     .113    11.3     228   142.4   95    2.5
8 30 PCT T      47   .500  14.08    826  14.631   11521      40     795     216     .077     3.1      61    16.6   31   13.2
9 C.T.        1742  3.450  10.68    191  16.011    3538     416    1540      14     .143    59.4     220     2.0    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    3.4      28    10.0
1 IDLE         170  1.320  12.84    110  14.344    3357      43     624       9     .232    10.0     145     2.0    0   14.4
2 30 PCT T      11   .450  13.90    778  14.362   11521      10     729     207     .077      .7      56    16.0   31   13.2
3 60 PCT T      26   .230  13.53   1601  13.788   16556      34     558     638     .147     5.0      82    93.8   63    8.2
4 30 PCT T      34   .470  14.03    729  14.537   11521      29     752     192     .077     2.2      58    14.8   31   13.2
5 10 PCT T      31   .500  14.18    290  14.713    8346      19     573      55     .057     1.1      33     3.1   10   16.7
6 30 PCT T      38   .440  13.95    732  14.431   11521      33     710     194     .077     2.5      55    14.9   31   13.2
7 90 PCT T      39   .600  13.76   2581  14.402   21954      64    1848    1306     .113     7.3     209   147.6   95    2.5
8 30 PCT T      34   .410  14.05    784  14.497   11521      29     658     207     .077     2.2      51    15.9   31   13.2
9 C.T.        1793  3.160   9.26    144  14.356    3538     477    1573      12     .143    68.2     225     1.7    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    3.3      30    10.2
1 IDLE         113  2.430  12.40    230  14.952    3357      27    1102      17     .232     6.4     256     4.0    0   14.4
2 30 PCT T      39   .420  13.90    800  14.362   11521      34     681     213     .077     2.6      52    16.4   31   13.2
3 60 PCT T      25   .230  13.49   1666  13.747   16556      33     560     666     .147     4.8      82    97.9   63    8.2
4 30 PCT T      28   .460  13.91    780  14.400   11521      24     743     207     .077     1.9      57    16.0   31   13.2
5 10 PCT T      22   .480  14.07    332  14.574    8346      14     555      63     .057      .8      32     3.6   10   16.7
6 30 PCT T      26   .410  13.97    820  14.408   11521      22     662     218     .077     1.7      51    16.8   31   13.2
7 90 PCT T      32   .510  13.75   2612  14.295   21954      53    1582    1332     .113     6.0     179   150.5   95    2.5
8 30 PCT T      27   .470  14.00    811  14.499   11521      23     754     214     .077     1.8      58    16.5   31   13.2
9 C.T.        1746  3.130   9.33    215  14.346    3538     465    1559      18     .143    66.5     223     2.5    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    3.0      33    10.7
1 IDLE         113  2.430  12.40    230  14.952    3357      27    1102      17     .232     6.4     256     4.0    0   14.4
2 30 PCT T      33   .440  13.96    752  14.436   11521      28     709     199     .077     2.2      55    15.3   31   13.2
3 60 PCT T      26   .220  13.59   1722  13.838   16556      34     532     684     .147     4.9      78   100.5   63    8.2
4 30 PCT T      28   .440  14.00    836  14.470   11521      24     708     221     .077     1.9      54    17.0   31   13.2
5 10 PCT T      26   .500  14.14    387  14.668    8346      16     575      73     .057      .9      33     4.2   10   16.7
6 30 PCT T      30   .490  13.94    846  14.462   11521      26     788     224     .077     2.0      61    17.2   31   13.2
7 90 PCT T      39   .590  13.78   2727  14.412   21954      64    1815    1379     .113     7.3     205   155.8   95    2.5
8 30 PCT T      30   .480  13.97    912  14.482   11521      26     771     241     .077     2.0      59    18.5   31   13.2
9 C.T.        1736  3.080   9.30    268  14.255    3538     465    1544      22     .143    66.5     221     3.2    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    3.1      34    11.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------    3.3      29    10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------    3.1      33    10.9
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     3.3) + 0.65(     3.1) =     3.161   GM/BHP HR
                                       CO- NDIR 0.35(    29.0) + 0.65(    33.1) =    31.681   GM/BHP HR
                                       NO2-NDIR 0.35(    10.1) + 0.65(    10.9) =    10.593   GM/BHP HR
                                                             CORRECTED NO2 =    11.331   GM/BHP HR
                                                                      BSFC =      .742   LB/BHP HR


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             CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR         WT.        WEIGHTED GM/HR          MAN.
MODE          HC-FID     CO    CO2  NO-CL  CARBON   CONS.      HC      CO     NO2     FACT.  HC-FID     CO  NO2-CL  HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE        2856  1.320  12.84     55  14.446    3357      66     620       4     .232    15.4     144     1.0    0   14.4
2 30 PCT T     311   .270  13.76    640  14.061   11521      25     447     174     .077     2.0      34    13.4   31   13.2
3 60 PCT T     253   .200  13.46   1675  13.685   16556      31     489     673     .147     4.5      72    98.9   63    8.2
4 30 PCT T     283   .310  13.91    700  14.248   11521      23     506     188     .077     1.8      39    14.5   31   13.2
5 10 PCT T     170   .270  14.09    225  14.377    8346      10     317      43     .057      .6      18     2.5   10   16.7
6 30 PCT T     226   .250  13.99    725  14.263   11521      18     408     194     .077     1.4      31    15.0   31   13.2
7 90 PCT T     907   .660  13.75   2500  14.501   21954     137    2018    1257     .113    15.5     228   142.0   95    2.5
8 30 PCT T     454   .500  14.08    775  14.625   11521      36     796     203     .077     2.8      61    15.6   31   13.2
9 C.T.       29398  3.450  10.68     75  17.070    3538     609    1444       5     .143    87.1     207      .7    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    4.3      27    10.0
1 IDLE        2856  1.320  12.84     55  14.446    3357      66     620       4     .232    15.4     144     1.0    0   14.4
2 30 PCT T     510   .450  13.90    738  14.401   11521      41     727     196     .077     3.1      56    15.1   31   13.2
3 60 PCT T     197   .230  13.53   1575  13.780   16556      24     558     628     .147     3.5      82    92.4   63    8.2
4 30 PCT T     425   .470  14.03    675  14.543   11521      34     752     178     .077     2.6      58    13.7   31   13.2
5 10 PCT T     341   .500  14.18    225  14.714    8346      19     573      42     .057     1.1      33     2.4   10   16.7
6 30 PCT T     397   .440  13.95    688  14.430   11521      32     710     182     .077     2.4      55    14.0   31   13.2
7 90 PCT T     821   .600  13.76   2600  14.442   21954     125    1842    1312     .113    14.1     208   148.3   95    2.5
8 30 PCT T     368   .410  14.05    750  14.497   11521      29     658     198     .077     2.3      51    15.2   31   13.2
9 C.T.       30325  3.160   9.26     38  15.452    3538     694    1461       3     .143    99.3     209      .4    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    4.7      29    10.0
1 IDLE        3298  2.430  12.40     63  15.160    3357      73    1087       5     .232    16.9     252     1.1    0   14.4
2 30 PCT T     503   .420  13.90    700  14.370   11521      40     680     186     .077     3.1      52    14.3   31   13.2
3 60 PCT T     209   .230  13.49   1575  13.740   16556      25     560     630     .147     3.6      82    92.6   63    8.2
4 30 PCT T     397   .460  13.91    687  14.410   11521      32     743     182     .077     2.4      57    14.0   31   13.2
5 10 PCT T     312   .480  14.07    225  14.581    8346      18     555      43     .057     1.0      32     2.4   10   16.7
6 30 PCT T     347   .410  13.97    700  14.415   11521      28     662     186     .077     2.1      51    14.3   31   13.2
7 90 PCT T     679   .510  13.75   2600  14.328   21954     104    1579    1323     .113    11.8     178   149.5   95    2.5
8 30 PCT T     454   .470  14.00    750  14.515   11521      36     754     198     .077     2.8      58    15.2   31   13.2
9 C.T.       30335  3.130   9.33     38  15.493    3538     693    1444       3     .143    99.1     206      .4    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    4.7      32    10.0
1 IDLE        3298  2.430  12.40     63  15.160    3357      73    1087       5     .232    16.9     252     1.1    0   14.4
2 30 PCT T     567   .440  13.96    613  14.457   11521      45     708     162     .077     3.5      55    12.5   31   13.2
3 60 PCT T     226   .220  13.59   1613  13.833   16556      27     532     641     .147     4.0      78    94.2   63    8.2
4 30 PCT T     440   .440  14.00    688  14.484   11521      35     707     182     .077     2.7      54    14.0   31   13.2
5 10 PCT T     334   .500  14.14    225  14.673    8346      19     574      42     .057     1.1      33     2.4   10   16.7
6 30 PCT T     411   .490  13.94    663  14.471   11521      33     788     175     .077     2.5      61    13.5   31   13.2
7 90 PCT T     864   .590  13.78   2650  14.456   21954     131    1810    1336     .113    14.8     205   151.0   95    2.5
8 30 PCT T     482   .480  13.97    800  14.498   11521      38     770     211     .077     2.9      59    16.3   31   13.2
9 C.T.       32544  3.080   9.30    100  15.634    3538     736    1408       8     .143   105.3     201     1.1    0   22.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------    5.1      33    10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------    4.5      28    10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------    4.9      32    10.0
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     4.5) + 0.65(     4.9) =     4.758   GM/BHP HR
                                       CO- NDIR 0.35(    28.5) + 0.65(    32.4) =    31.019   GM/BHP HR
                                       NO2-CL   0.35(    10.0) + 0.65(    10.0) =    10.019   GM/BHP HR
                                                             CORRECTED NO2 =    10.717   GM/BHP HR
                                                                      BSFC =      .742   LB/BHP HR
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TABLE F-46 MASS EMISSIONS BY NINE-MODE EPA

ENGINE 6-OP TEST-66 RUN-5 PARAMETRIC BASELINE 08-09-73 K =1.079 HUM =104.2 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	121	1.600	12.69	138	14.921	3357	30	752	11	.232	7.1	176	2.6	0	14.9
2 30 PCT T	66	.320	13.76	767	14.151	11521	58	526	207	.077	4.5	41	16.0	31	13.2
3 60 PCT T	55	.230	13.37	1584	13.659	16556	72	563	637	.147	10.6	83	93.7	63	8.2
4 30 PCT T	57	.280	13.78	725	14.182	11521	50	461	196	.077	3.9	36	15.1	31	13.2
5 10 PCT T	60	.310	14.02	291	14.384	8346	31	363	56	.057	1.8	21	3.2	10	16.7
6 30 PCT T	49	.270	13.72	759	14.093	11521	43	447	207	.077	3.3	34	15.9	31	13.2
7 90 PCT T	61	.650	13.57	2638	14.286	21954	101	2018	1346	.113	11.4	228	152.1	95	2.5
8 30 PCT T	53	.560	13.84	830	14.457	11521	46	901	220	.077	3.5	69	16.9	31	13.2
9 C.T.	1846	3.110	9.20	125	14.304	3538	493	1554	10	.143	70.5	222	1.5	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											3.8	30	10.4		
1 IDLE	121	1.600	12.69	138	14.921	3357	30	752	11	.232	7.1	175	2.5	0	14.9
2 30 PCT T	86	.420	13.75	699	14.263	11521	75	685	187	.077	5.8	53	14.4	31	13.2
3 60 PCT T	77	.230	13.42	1648	13.733	16556	100	560	660	.147	14.7	82	97.0	63	8.2
4 30 PCT T	76	.330	13.81	764	14.222	11521	66	540	205	.077	5.1	42	15.8	31	13.2
5 10 PCT T	69	.500	13.94	286	14.566	8346	43	579	54	.057	2.4	33	3.1	10	16.7
6 30 PCT T	69	.360	13.80	764	14.238	11521	60	584	207	.077	4.6	45	15.9	31	13.2
7 90 PCT T	79	.620	13.63	2632	14.335	21954	131	1918	1338	.113	14.8	217	151.2	95	2.5
8 30 PCT T	67	.440	13.93	800	14.442	11521	58	709	212	.077	4.4	55	16.3	31	13.2
9 C.T.	1801	3.040	9.27	140	14.255	3538	483	1524	12	.143	69.0	218	1.6	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											4.2	30	10.5		
1 IDLE	122	2.370	12.44	111	14.942	3357	30	1076	8	.232	6.9	250	1.9	0	14.9
2 30 PCT T	68	.390	13.69	692	14.195	11521	53	642	187	.077	4.1	49	14.4	31	13.2
3 60 PCT T	51	.220	13.91	1612	13.685	16556	67	538	647	.147	9.8	79	95.2	63	8.2
4 30 PCT T	52	.360	13.84	775	14.256	11521	45	588	208	.077	3.5	45	16.0	31	13.2
5 10 PCT T	47	.480	13.95	281	14.481	8346	29	559	54	.057	1.7	32	3.1	10	16.7
6 30 PCT T	34	.340	13.82	768	14.202	11521	34	557	207	.077	2.6	43	15.9	31	13.2
7 90 PCT T	49	.540	13.63	2635	14.223	21954	82	1684	1350	.113	9.2	190	152.6	95	2.5
8 30 PCT T	46	.480	13.83	787	14.360	11521	40	778	210	.077	3.1	60	16.1	31	13.2
9 C.T.	1817	3.200	9.14	151	14.302	3538	485	1599	12	.143	69.4	229	1.8	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											3.6	32	10.4		
1 IDLE	121	2.370	12.44	111	14.941	3357	29	1076	8	.232	6.8	250	1.9	0	14.9
2 30 PCT T	53	.390	13.79	712	14.237	11521	46	638	191	.077	3.6	49	14.7	31	13.2
3 60 PCT T	38	.220	13.91	1669	13.671	16556	50	538	669	.147	7.3	79	98.3	63	8.2
4 30 PCT T	42	.320	13.87	724	14.235	11521	37	523	195	.077	2.8	40	15.0	31	13.2
5 10 PCT T	33	.610	13.89	242	14.536	8346	20	707	46	.057	1.2	40	2.6	10	16.7
6 30 PCT T	40	.390	13.78	744	14.213	11521	35	639	208	.077	2.7	49	15.5	31	13.2
7 90 PCT T	55	.710	13.60	2560	14.364	21954	91	2191	1299	.113	10.3	248	146.7	95	2.5
8 30 PCT T	47	.470	13.88	810	14.401	11521	41	760	215	.077	3.1	58	16.6	31	13.2
9 C.T.	1919	3.090	9.06	100	14.213	3538	516	1554	8	.143	73.8	222	1.2	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											3.7	34	10.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											4.0	30	10.4		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											3.7	33	10.4		
FOUR CYCLE COMPOSITE -															

HC- NDIR 0.35(4.0) + 0.65(3.7) = 3.783 GM/BHP HR
CO- NDIR 0.35(30.1) + 0.65(33.1) = 32.065 GM/BHP HR
NO2-NDIR 0.35(10.4) + 0.65(10.4) = 10.395 GM/BHP HR
CORRECTED NO2 = 11.169 GM/BHP HR
BSFC = .742 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	2321	1.600	12.69	50	14.522	3357	54	747	4	.232	12.4	173	.9	0	14.9
2 30 PCT T	346	.320	13.76	670	14.115	11521	28	528	182	.077	2.2	41	14.0	31	13.2
3 60 PCT T	218	.230	13.37	1525	13.688	16556	27	565	615	.147	3.9	83	90.5	63	8.2
4 30 PCT T	247	.280	13.78	662	14.085	11521	20	463	180	.077	1.6	36	13.8	31	13.2
5 10 PCT T	156	.310	14.02	238	14.396	8346	9	364	46	.057	.5	21	2.6	10	16.7
6 30 PCT T	367	.270	13.72	688	14.087	11521	30	448	188	.077	2.3	34	14.4	31	13.2
7 90 PCT T	851	.650	13.57	2600	14.305	21954	131	2015	1325	.113	14.8	228	149.7	95	2.5
8 30 PCT T	453	.560	13.84	800	14.445	11521	36	902	212	.077	2.8	69	16.3	31	13.2
9 C.T.	26956	3.110	9.20	25	15.006	3538	636	1481	2	.143	90.9	212	.3	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											4.3	30	10.0		
1 IDLE	2321	1.600	12.69	50	14.522	3357	54	747	4	.232	12.4	173	.9	0	14.9
2 30 PCT T	411	.420	13.75	630	14.211	11521	33	688	170	.077	2.6	53	13.1	31	13.2
3 60 PCT T	190	.230	13.42	1575	13.669	16556	23	563	633	.147	3.4	83	93.1	63	8.2
4 30 PCT T	311	.330	13.81	688	14.171	11521	25	542	186	.077	1.9	42	14.3	31	13.2
5 10 PCT T	277	.500	13.94	225	14.518	8346	16	581	43	.057	.9	33	2.4	10	16.7
6 30 PCT T	283	.360	13.80	688	14.188	11521	23	590	185	.077	1.8	45	14.3	31	13.2
7 90 PCT T	828	.620	13.63	2600	14.333	21954	127	1918	1322	.113	14.3	217	149.4	95	2.5
8 30 PCT T	411	.440	13.93	800	14.411	11521	33	711	212	.077	2.5	55	16.3	31	13.2
9 C.T.	28069	3.040	9.27	25	15.117	3538	657	1437	2	.143	93.9	206	.3	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											4.4	30	10.0		
1 IDLE	3013	2.370	12.44	55	15.111	3357	67	1064	4	.232	15.5	247	.9	0	14.9
2 30 PCT T	424	.390	13.69	605	14.122	11521	35	643	164	.077	2.7	49	12.6	31	13.2
3 60 PCT T	204	.220	13.91	1563	13.650	16556	25	539	629	.147	3.6	79	92.5	63	8.2
4 30 PCT T	298	.360	13.84	700	14.230	11521	24	589	188	.077	1.9	45	14.5	31	13.2
5 10 PCT T	362	.480	13.95	213	14.466	8346	21	559	41	.057	1.2	32	2.3	10	16.7
6 30 PCT T	268	.390	13.82	675	14.187	11521	22	558	182	.077	1.7	43	14.0	21	13.2
7 90 PCT T	770	.540	13.63	2700	14.247	21954	119	1681	1381	.113	13.4	190	156.1	95	2.5
8 30 PCT T	411	.480	13.83	750	14.351	11521	33	778	200	.077	2.5	60	15.4	31	13.2
9 C.T.	28968	3.200	9.14	20	15.237	3538	673	1501	2	.143	96.2	215	.2	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											4.6	32	10.2		
1 IDLE	3013	2.370	12.44	55	15.111	3357	67	1064	4	.232	15.5	247	.9	0	14.9
2 30 PCT T	441	.390	13.79	680	14.224	11521	36	638	183	.077	2.8	49	14.1	31	13.2
3 60 PCT T	218	.220	13.91	1675	13.658	16556	26	539	674	.147	3.9	79	99.1	63	8.2
4 30 PCT T	311	.320	13.87	713	14.281	11521	25	524	192	.077	1.9	40	14.8	31	13.2
5 10 PCT T	179	.610	13.89	225	14.838	8346	22	707	43	.057	1.2	40	2.4	10	16.7
6 30 PCT T	311	.390	13.78	738	14.201	11521	25	639	199	.077	1.9	49	15.3	31	13.2
7 90 PCT T	878	.710	13.60	2600	14.398	21954	134	2197	1316	.113	15.1	247	148.7	95	2.5
8 30 PCT T	481	.470	13.88	850	14.398	11521	39	760	226	.077	3.0	58	17.4	31	13.2
9 C.T.	30254	3.090	9.08	20	15.255	3538	706	1456	2	.143	100.9	208	.2	0	22.2
CYCLE COMPOSITE IN GM/BHP HR											4.8	34	10.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											4.4	30	10.0		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											4.7	33	10.2		
FOUR CYCLE COMPOSITE -															

HC- FID 0.35(4.5) + 0.65(4.7) = 4.578 GM/BHP HR
CO- NDIR 0.35(29.7) + 0.65(32.6) = 31.567 GM/BHP HR
NO2-CL 0.35(10.0) + 0.65(10.2) = 10.198 GM/BHP HR
CORRECTED NO2 = 10.903 GM/BHP HR
BSFC = .742 LB/BHP HR

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                         TABLE F-47 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST 65  RUN-2   EGR 5 PCT. PINTLE 4-1 08-13-73     K =1.053     HUM = 44.2  GR/LB
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              CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR           MAN.
MODE           HC      CO     CO2     NO  CARBON   CONS.     HC      CO     NO2    FACT.    HC     CO     NO2    HP   VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE         89   1.780   12.55    105  14.926    3583     24     893      9    .232     5.5    207    2.0     0  14.3
2 30 PCT T     28    .150   13.81    268  13.990   12610     27     273     80    .077     2.1     21    6.2    31  10.4
3 60 PCT T     62   1.310   13.86   1311  15.237   17146     75    2978    490    .147    11.1    438   72.0    63   6.6
4 30 PCT T     27    .170   13.97    305  14.169   12610     26     306     90    .077     2.0     24    6.9    31  10.4
5 10 PCT T     27    .250   14.37    190  14.649    8936     18     308     38    .057     1.0     18    2.2    10  14.7
6 30 PCT T     26    .190   14.02    296  14.188   12610     25     251     87    .077     1.9     19    6.7    31  10.4
7 90 PCT T     45    .910   13.41   2416  14.869   21410     70    2647   1155    .113     7.9    299  130.5    44   2.1
8 30 PCT T     29    .160   14.17    353  14.361   12610     28     284    103    .077     2.1     22    7.9    31  10.4
9 C.T.       1595   2.880    9.77    100  14.373    3765    451    1524      9    .143    64.5    218    1.2     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.2     42    7.8
1 IDLE         89   1.780   12.55    105  14.926    3583     24     893      9    .232     5.5    207    2.0     0  14.3
2 30 PCT T     34    .200   14.16    313  14.397   12610     32     354     91    .077     2.5     27    7.0    31  10.4
3 60 PCT T     67   1.620   13.73   1291  15.422   17146     80    3638    477    .147    11.8    535   70.0    63   6.6
4 30 PCT T     32    .200   14.17    353  14.408   12610     30     354    103    .077     2.3     27    7.9    31  10.4
5 10 PCT T     32    .350   14.39    192  14.775    8936     21     428     39    .057     1.2     24    2.2    10  14.7
6 30 PCT T     28    .210   14.23    327  14.470   12610     26     370     95    .077     2.0     28    7.3    31  10.4
7 90 PCT T     41    .720   14.07   2661  14.834   21410     64    2099   1270    .113     7.2    237  143.5    44   2.1
8 30 PCT T     31    .190   14.38    359  14.603   12610     29     331    101    .077     2.2     26    7.8    31  10.4
9 C.T.       1588   2.770    9.83    100  14.315    3765    451    1472      9    .143    64.5    210    1.2     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.3     44    8.2
1 IDLE        101   1.820   13.01    114  14.939    3583     26     882      9    .232     6.1    205    2.1     0  14.3
2 30 PCT T     34    .210   14.18    318  14.427   12610     32     371     92    .077     2.5     29    7.1    31  10.4
3 60 PCT T     66   1.790   13.58   1194  15.441   17146     79    4015    440    .147    11.6    590   64.7    63   6.6
4 30 PCT T     33    .260   14.32    333  14.616   12610     31     453     95    .077     2.4     35    7.3    31  10.4
5 10 PCT T     34    .600   14.35    197  14.987    8936     22     723     39    .057     1.2     41    2.2    10  14.7
6 30 PCT T     28    .280   14.30    338  14.610   12610     26     488     97    .077     2.0     38    7.5    31  10.4
7 90 PCT T     43    .700   14.07   2647  14.816   21410     67    2043   1294    .113     7.6    231  146.2    44   2.1
8 30 PCT T     32    .200   14.37 [illegible] 14.605 12610   30     349    101    .077     2.3     27    7.8    31  10.4
9 C.T.       1610   2.600    9.88    102  14.159    3765    462    1397      9    .143    66.1    200    1.3     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.4     46    8.1
1 IDLE        101   1.820   13.01    114  14.939    3583     26     882      9    .232     6.1    205    2.1     0  14.3
2 30 PCT T     36    .220   14.17    316  14.429   12610     34     388     92    .077     2.6     30    7.1    31  10.4
3 60 PCT T     62   1.630   13.71   1315  15.407   17146     75    3664    486    .147    11.0    539   71.4    63   6.6
4 30 PCT T     31    .270   14.30    344  14.605   12610     29     471     99    .077     2.2     36    7.6    31  10.4
5 10 PCT T     33    .480   14.48    213  14.996    8936     21     578     42    .057     1.2     33    2.4    10  14.7
6 30 PCT T     26    .280   14.32    358  14.628   12610     24     488    102    .077     1.9     38    7.9    31  10.4
7 90 PCT T     51   1.060   13.91   2988  15.025   21410     78    3051   1177    .113     8.8    345  133.0    44   2.1
8 30 PCT T     26    .220   14.36    389  14.608   12610     24     384    111    .077     1.9     30    8.6    31  10.4
9 C.T.       1724   2.760    9.59    126  14.212    3765    493    1477     11    .143    70.5    211    1.6     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     3.5     48    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     3.3     43    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     3.4     47    8.1
FOUR CYCLE COMPOSITE -                    HC- NDIR 0.35(    3.3) + 0.65(    3.4) =   3.379   GM/BHP HR
                                          CO- NDIR 0.35(   42.8) + 0.65(   47.3) =  45.711   GM/BHP HR
                                          NO2-NDIR 0.35(    8.0) + 0.65(    8.1) =   8.049   GM/BHP HR
                                                           CORRECTED NO2 =   8.477   GM/BHP HR
                                                                    BSFC =    .7[illegible]  LB/BHP HR


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              CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR           MAN.
MODE        HC-FID     CO     CO2  NO-CL  CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP   VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE       2265   1.780   12.55     50  14.557    3583     56     885      4    .232    12.9    205     .9     0  14.3
2 30 PCT T    176    .150   13.81    235  13.978   12610     16     273     71    .077     1.2     21    5.4    31  10.4
3 60 PCT T   1347   1.310   13.86   1250  15.305   17146    151    2965    465    .147    22.2    436   68.4    63   6.6
4 30 PCT T     92    .170   13.97    285  14.199   12610      8     306     84    .077      .6     24    6.5    31  10.4
5 10 PCT T    135    .250   14.37    150  14.634    8936      8     308     30    .057      .5     18    1.7    10  14.7
6 30 PCT T     78    .190   14.02    270  14.160   12610      7     252     80    .077      .5     19    6.1    31  10.4
7 90 PCT T    883    .910   13.41   2350  14.908   21410    122    2647   1121    .113    13.8    299  126.7    44   2.1
8 30 PCT T     85    .160   14.17    325  14.338   12610      7     284     95    .077      .5     22    7.3    31  10.4
9 C.T.      25244   2.880    9.77     25  15.174    3765    626 [illegible]   2    .143    89.6    206     .3     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     4.7     41    7.4
1 IDLE       2265   1.780   12.55     50  14.557    3583     56     885      4    .232    12.9    205     .9     0  14.3
2 30 PCT T    198    .200   14.16    287  14.380   12610     17     354     84    .077     1.3     27    6.4    31  10.4
3 60 PCT T   1542   1.620   13.73   1187  15.504   17146    170    3619    436    .147    25.1    532   64.1    63   6.6
4 30 PCT T    154    .200   14.17    325  14.386   12610     14     354     95    .077     1.1     27    7.3    31  10.4
5 10 PCT T    256    .350   14.39     75  14.766    8936     15     428     15    .057      .9     24     .9    10  14.7
6 30 PCT T    135    .210   14.23    312  14.453   12610     12     370     90    .077      .9     28    7.0    31  10.4
7 90 PCT T    859    .720   14.07   2600  14.876   21410    124    2099   1242    .113    14.0    237  140.4    44   2.1
8 30 PCT T    120    .190   14.38    320  14.582   12610     10     332     92    .077      .8     26    7.1    31  10.4
9 C.T.      29477   2.770    9.83     25  15.448    3765    714    1355      2    .143   102.1    194     .3     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     5.[illegible]  43    7.7
1 IDLE       2985   1.820   13.01     50  15.129    3583     71     871      4    .232    16.4    202     .9     0  14.3
2 30 PCT T    227    .210   14.18    280  14.413   12610     20     371     81    .077     1.5     29    6.2    31  10.4
3 60 PCT T   1570   1.790   13.58   1112  15.587   17146    179    3999    408    .147    26.3    587   60.0    63   6.6
4 30 PCT T    212    .260   14.32    325  14.601   12610     18     450     94    .077     1.4     35    7.2    31  10.4
5 10 PCT T    427    .600   14.35    175  14.993    8936     25     722     35    .057     1.4     41    2.0    10  14.7
6 30 PCT T    170    .280   14.30    312  14.597   12610     15     488     89    .077     1.1     38    6.9    31  10.4
7 90 PCT T    746    .700   14.07   2700  14.880   21410    118    2039   1292    .113    13.3    230  146.1    44   2.1
8 30 PCT T    127    .200   14.37    320  14.583   12610     11     349     92    .077      .8     27    7.1    31  10.4
9 C.T.      29879   2.600    9.82     25  15.408    3765    730    1283      2    .143   104.4    184     .3     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     5.5     45    7.8
1 IDLE       2985   1.820   13.01     50  15.129    3583     71     871      4    .232    16.4    202     .9     0  14.3
2 30 PCT T    227    .220   14.17    270  14.417   12610     20     389     78    .077     1.5     30    6.0    31  10.4
3 60 PCT T   1656   1.630   13.71   1225  15.506   17146    183    3641    450    .147    26.9    535   66.1    63   6.6
4 30 PCT      100    .270   14.30    300  14.580   12610      9     472     86    .077      .7     36    6.6    31  10.4
5 10 PCT T    171    .480   14.48    150  14.977    8936     10     579     30    .057      .6     33    1.7    10  14.7
6 30 PCT T    100    .280   14.32    305  14.610   12610      9     488     87    .077      .7     38    6.7    31  10.4
7 90 PCT T    584   1.060   13.91   2950  15.028   21410     83    3050   1159    .113     9.4    345  130.9    44   2.1
8 30 PCT T     85    .220   14.36    300  14.589   12610      7     384     86    .077      .6     30    6.6    31  10.4
9 C.T.      31644   2.760    9.59     25  15.514    3765    760    1353      2    .143   108.8    193     .3     0  22.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------     5.5     48
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------     5.0     42
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------     5.5     47
FOUR CYCLE COMPOSITE -                    HC- FID  0.35(    5.0) + 0.65(    5.5) =   5.312   GM/BHP HR
                                          CO- NDIR 0.35(   42.2) + 0.65(   46.5) =  44.998   GM/BHP HR
                                          NO2-CL   0.35(    7.6) + 0.65(    7.6) =   7.619   GM/BHP HR
                                                           CORRECTED NO2 =   8.024   GM/BHP HR
                                                                    BSFC =    .780   LB/BHP HR
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                     TABLE F-48 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST 65  RUN=1   EGR 10 PCT. PINTLE 4-1 8-08-73      H =[illegible]     HUM =109.4  GR/LB
----------------------------------------------------------------------------------------------------------------
MODE            CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR              FAN.
                 HC      CO     CO2    NO   CARBON   CONS.     HC      CO     NO2   FACT.   HC       CO     NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE          274    .370   13.02    98   13.686    3402     74     186      8    .232   17.1      43     1.9    0    13.3
2 30 PCT T       64    .180   14.03   185   14.279   12519     61     319     54    .077    4.7      25     4.1   32    10.2
3 60 PCT T       83   1.900   14.10   667   15.590   17328    100    3143    246    .147   14.6     462    36.2   64     6.6
4 30 PCT T       47    .170   14.20   203   14.421   12519     44     298     59    .077    3.4      23     4.5   32    10.2
5 10 PCT T       38    .220   14.63   165   14.891    9707     27     290     36    .057    1.5      17     2.0   10    14.4
6 30 PCT T       35    .170   14.28   248   14.488   12519     33     297     71    .077    2.5      23     5.5   32    10.2
7 90 PCT T       49    .390   14.25  2033   14.693   22045     79    1182   1013    .113    9.0     134   114.4   96     2.1
8 30 PCT T       36    .160   14.39   267   14.589   12519     33     277     76    .077    2.6      21     5.9   32    10.2
9 C.T.         1307   1.980   10.68    94   13.572    3538    368     779      8    .143   52.6     111     1.2    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.5      28     5.7
1 IDLE          274    .370   13.02    98   13.686    3402     74     186      8    .232   17.1      43     1.9    0    13.3
2 30 PCT T       50    .180   14.20   250   14.434   12519     47     315     72    .077    3.6      24     5.5   32    10.2
3 60 PCT T       66   1.270   14.15   751   15.491   17328     80    2820    279    .147   11.7     422    41.0   64     6.6
4 30 PCT T       35    .200   14.31   240   14.548   12519     33     348     69    .077    2.5      27     5.3   32    10.2
5 10 PCT T       36    .390   14.62   173   15.044    9707     25     508     37    .057    1.4      29     2.1   10    14.4
6 30 PCT T       32    .180   14.33   294   14.545   12519     30     313     84    .077    2.3      24     6.5   32    10.2
7 90 PCT T       48    .520   14.31  2208   14.882   22045     77    1556   1086    .113    8.7     176   122.7   96     2.1
8 30 PCT T       37    .260   14.57   305   14.870   12519     34     442     85    .077    2.6      34     6.6   32    10.2
9 C.T.         1312   1.690   10.61   126   13.717    3538    365     881     11    .143   52.3     126     1.6    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.3      29     6.3
1 IDLE          176    .720   13.63   136   14.590    3402     44     340     11    .232   10.3      79     2.5    0    13.3
2 30 PCT T       43    .250   14.38   257   14.676   12519     40     431     73    .077    3.1      33     5.6   32    10.2
3 60 PCT T       73   1.530   14.00   700   15.609   17328     88    3431    258    .147   12.9     504    37.9   64     6.6
4 30 PCT T       37    .180   14.46   259   14.680   12519     34     310     73    .077    2.6      24     5.6   32    10.2
5 10 PCT T       40    .490   14.56   203   15.093    9707     28     637     43    .057    1.6      36     2.5   10    14.4
6 30 PCT T       34    .200   14.46   293   14.697   12519     31     344     83    .077    2.4      26     6.4   32    10.2
7 90 PCT T       34    .390   14.28  2074   14.712   22045     63    1180   1032    .113    7.1     133   116.6   96     2.1
8 30 PCT T       33    .190   14.52   314   14.746   12519     30     326     89    .077    2.3      25     6.8   32    10.2
9 C.T.         1285   1.490   10.81   120   13.688    3538    359     778     10    .143   51.3     111     1.5    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.0      32     6.0
1 IDLE          176    .720   13.63   136   14.590    3402     44     340     11    .232   10.3      79     2.5    0    13.3
2 30 PCT T       40    .220   14.30   220   14.563   12519     37     382     63    .077    2.9      29     4.8   32    10.2
3 60 PCT T       64   1.380   14.07   741   15.519   17328     77    3113    275    .147   11.3     458    40.4   64     6.6
4 30 PCT T       34    .180   14.35   255   14.567   12519     32     312     73    .077    2.4      24     5.6   32    10.2
5 10 PCT T       36    .420   14.56   158   15.018    9707     25     548     34    .057    1.4      31     1.9   10    14.4
6 30 PCT T       26    .170   14.33   262   14.520   12519     24     296     75    .077    1.8      23     5.8   32    10.2
7 90 PCT T       39    .530   14.31  2161   14.882   22045     62    1586   1063    .113    7.1     179   120.1   96     2.1
8 30 PCT T       32    .250   14.47   260   14.755   12519     29     428     73    .077    2.3      33     5.6   32    10.2
9 C.T.         1360   1.580   10.70    87   13.749    3538    378     821      7    .143   54.0     117     1.1    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.0      32     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    3.4      29     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    3.0      32     6.1
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(     3.4) + 0.65(     3.0) =    3.133   GM/BHP HR
                                  CO- NDIR 0.35(    28.7) + 0.65(    31.6) =   30.591   GM/BHP HR
                                  NO2-NDIR 0.35(     6.0) + 0.65(     6.1) =    6.039   GM/BHP HR
                                                    CORRECTED NO2 =    6.545   GM/BHP HR
                                                             BSFC =     .770   LB/BHP HR


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MODE            CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR       WT.     WEIGHTED GM/HR               FAN.
               HC-FID    CO     CO2  NO-CL  CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID     CO   NO2-CL  HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE         5057    .370   13.02    50   13.896    3402    124     183      4    .232   28.7      42      .9    0    13.3
2 30 PCT T      339    .180   14.03   145   14.244   12519     30     320     42    .077    2.3      25     3.3   32    10.2
3 60 PCT T     1986   1.900   14.10   635   15.649   17328    165    3131    233    .147   24.2     460    34.3   64     6.6
4 30 PCT T      355    .170   14.20   190   14.405   12519     31     298     55    .077    2.4      23     4.2   32    10.2
5 10 PCT T      299    .220   14.63   100   14.875    9707     16     290     22    .057     .9      17     1.2   10    14.4
6 30 PCT T      167    .170   14.28   195   14.467   12519     14     297     56    .077    1.1      23     4.3   32    10.2
7 90 PCT T      670    .390   14.25  2000   14.707   22045    100    1181    995    .113   11.3     133   112.5   96     2.1
8 30 PCT T      195    .160   14.39   225   14.565   12519     12     278     64    .077    1.0      21     4.9   32    10.2
9 C.T.        22250   1.980   10.68    20   14.385    3538    547     735      2    .143   78.3     105      .2    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    4.9      28     5.4
1 IDLE         5057    .370   13.02    50   13.896    3402    124     183      4    .232   28.7      42      .9    0    13.3
2 30 PCT T      403    .180   14.20   190   14.420   12519     35     316     55    .077    2.7      24     4.2   32    10.2
3 60 PCT T     1371   1.270   14.15   680   15.557   17328    153    2857    251    .147   22.5     420    37.0   64     6.6
4 30 PCT T      170    .200   14.31   205   14.527   12519     15     348     59    .077    1.1      27     4.5   32    10.2
5 10 PCT T      256    .390   14.62   100   15.036    9707     17     509     21    .057     .9      29     1.2   10    14.4
6 30 PCT T      113    .180   14.33   220   14.521   12519     10     313     63    .077     .8      24     4.8   32    10.2
7 90 PCT T      753    .520   14.31  2113   14.905   22045    111    1554   1038    .113   12.6     176   117.2   96     2.1
8 30 PCT T      171    .260   14.57   237   14.847   12519     14     443     66    .077    1.1      34     5.1   32    10.2
9 C.T.        23167   1.690   10.61    23   14.617    3538    561     826      2    .143   80.2     118      .3    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    4.9      29     5.7
1 IDLE         3002    .720   13.63    55   14.650    3402     70     338      4    .232   16.2      78     1.0    0    13.3
2 30 PCT T      284    .250   14.38   185   14.658   12519     24     431     52    .077    1.9      33     4.0   32    10.2
3 60 PCT T     1644   1.530   14.00   620   15.694   17328    171    3414    227    .147   25.1     502    33.4   64     6.6
4 30 PCT T      192    .180   14.46   195   14.654   12519     12     311     55    .077     .9      24     4.3   32    10.2
5 10 PCT T      319    .490   14.56   105   15.081    9707     20     637     22    .057    1.1      36     1.3   10    14.4
6 30 PCT T      170    .200   14.46   230   14.677   12519     15     345     65    .077    1.1      27     5.0   32    10.2
7 90 PCT T      568    .390   14.28  2088   14.727   22045     85    1179   1038    .113    9.6     133   117.3   96     2.1
8 30 PCT T      142    .190   14.52   238   14.724   12519     12     326     67    .077     .9      25     5.2   32    10.2
9 C.T.        21384   1.490   10.81    20   14.438    3538    524     738      2    .143   74.9     105      .2    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    4.3      31     5.6
1 IDLE         3002    .720   13.63    55   14.650    3402     70     338      4    .232   16.2      78     1.0    0    13.3
2 30 PCT T      284    .220   14.30   200   14.548   12519     24     382     57    .077    1.9      29     4.4   32    10.2
3 60 PCT T     1966   1.380   14.07   670   15.597   17328    163    3097    247    .147   23.9     455    36.3   64     6.6
4 30 PCT T      217    .190   14.35   235   14.552   12519     19     313     67    .077    1.4      24     5.2   32    10.2
5 10 PCT T      320    .420   14.56   110   15.012    9707     21     549     24    .057    1.2      31     1.3   10    14.4
6 30 PCT T      120    .170   14.33   220   14.512   12519     10     296     63    .077     .8      23     4.9   32    10.2
7 90 PCT T      689    .530   14.31  2150   14.909   22045    102    1583   1055    .113   11.5     179   119.3   96     2.1
8 30 PCT T      164    .250   14.47   250   14.736   12519     14     429     71    .077    1.1      33     5.4   32    10.2
9 C.T.        22995   1.580   10.70    15   14.529    3538    548     777      1    .143   78.3     111      .2    0    21.5
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    4.4      31     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    4.9      28     5.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    4.4      31     5.7
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(     4.9) + 0.65(     4.4) =    4.573   GM/BHP HR
                                  CO- NDIR 0.35(    28.3) + 0.65(    31.3) =   30.292   GM/BHP HR
                                  NO2-CL   0.35(     5.5) + 0.65(     5.7) =    5.634   GM/BHP HR
                                                    CORRECTED NO2 =    6.106   GM/BHP HR
                                                             BSFC =     .770   LB/BHP HR
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                          TABLE F-49 MASS EMISSIONS BY NINE-MODE EPA
ENGINE-6-UP  TEST-65  RUN-3   EGR 15 PCT, PINTLE 4-1 8-09-73      K =1.085     HUM =109.9  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE             HC      CO     CO2     NO   CARBON   CONS.     HC      CO     NO2    FACT.    HC       CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          460   1.810   12.11     78   14.417    3447    119     874      6    .232    27.6     203     1.4     0    13.7
2 30 PCT T       67    .190   13.79    131   14.002   12610     65     346     39    .077     5.0      27     3.0    31     9.0
3 60 PCT T       83   1.530   13.87    553   15.490   17282    100    3448    205    .147    14.7     507    30.1    63     6.0
4 30 PCT T       37    .240   14.23    154   14.510   12610     35     421     46    .077     2.7      32     3.5    31     9.0
5 10 PCT T       28    .400   14.43     48   14.871   10161     20     552     22    .057     1.6      31     1.3    10    12.5
6 30 PCT T       33    .230   13.98    201   14.246   12610     32     411     59    .077     2.4      32     4.5    31     9.0
7 90 PCT T       47    .590   14.09   1870   14.731   22045     76    1784    929    .113     8.6     202   105.0    95     2.0
8 30 PCT T       32    .190   14.31    184   14.535   12610     30     333     54    .077     2.3      26     4.2    31     9.0
9 C.T.         1746   3.100    9.66     73   14.696    3719    479    1590      6    .143    68.5     227      .9     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.4      42     5.1
1 IDLE          460   1.910   12.11     78   14.417    3447    119     874      6    .232    27.6     203     1.4     0    13.7
2 30 PCT T       42    .250   14.18    136   14.475   12610     40     440     39    .077     3.0      34     3.0    31     9.0
3 60 PCT T       80   1.870   13.71    520   15.666   17282     95    4167    190    .147    14.0     613    28.0    63     6.0
4 30 PCT T       37    .280   14.31    143   14.630   12610     34     488     41    .077     2.7      38     3.2    31     9.0
5 10 PCT T       34    .560   14.52     80   15.117   10161     25     760     18    .057     1.4      43     1.0    10    12.5
6 30 PCT T       36    .270   14.25    161   14.559   12610     34     478     46    .077     2.6      36     3.6    31     9.0
7 90 PCT T       40    .570   14.19   1764   14.803   22045     64    1718    872    .113     7.3     194    98.6    95     2.0
8 30 PCT T       30    .210   14.39    144   14.682   12610     28     366     41    .077     2.1      28     3.2    31     9.0
9 C.T.         1787   2.900    9.61     82   14.490    3719    497    1509      7    .143    71.1     216     1.0     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.3      46     4.7
1 IDLE           99   2.000   13.04     92   15.197    3447     24     919      7    .232     5.6     213     1.6     0    13.7
2 30 PCT T       43    .210   14.13    118   14.386   12610     41     372     34    .077     3.1      29     2.6    31     9.0
3 60 PCT T       79   2.000   13.62    508   15.708   17282     94    4496    186    .147    13.8     664    27.3    63     6.0
4 30 PCT T       31    .250   14.40    180   14.683   12610     29     434     54    .077     2.2      33     4.1    31     9.0
5 10 PCT T       35    .710   14.39    110   15.138   10161     25     963     25    .057     1.4      55     1.4    10    12.5
6 30 PCT T       33    .210   14.28    186   14.526   12610     31     368     54    .077     2.4      28     4.1    31     9.0
7 90 PCT T       38    .570   14.13   1723   14.791   22045     61    1722    855    .113     6.9     195    96.7    95     2.0
8 30 PCT T       32    .230   14.39    196   14.655   12610     30     400     56    .077     2.3      31     4.3    31     9.0
9 C.T.         1765   2.690    9.03     89   14.486    3719    491    1401      7    .143    70.3     200     1.0     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.6      47     4.7
1 IDLE           99   2.000   13.04     92   15.197    3447     24     919      7    .232     5.6     213     1.6     0    13.7
2 30 PCT T       36    .240   14.12    173   14.399   12610     34     425     50    .077     2.6      33     3.9    31     9.0
3 60 PCT T       78   2.010   13.59    500   15.684   17282     93    4474    183    .147    13.6     658    26.9    63     6.0
4 30 PCT T       35    .340   14.39    180   14.768   12610     32     586     51    .077     2.5      45     3.9    31     9.0
5 10 PCT T       42    .690   14.31    110   15.095   10161     31     941     25    .057     1.7      54     1.4    10    12.5
6 30 PCT T       31    .260   14.28    192   14.573   12610     29     454     55    .077     2.2      35     4.2    31     9.0
7 90 PCT T       41    .570   14.17   1698   14.784   22045     66    1717    841    .113     7.5     194    95.0    95     2.0
8 30 PCT T       31    .240   14.35    191   14.623   12610     29     418     55    .077     2.2      32     4.2    31     9.0
9 C.T.         1631   2.590    9.09     87   14.291    3719    460    1366      8    .143    65.8     195     1.1     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     3.4      48     4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.4      44     4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     3.5      48     4.7
FOUR CYCLE COMPOSITE -
                                        HC= NDIR 0.35(     4.4) + 0.65(     3.5) =    3.796   GM/BHP HR
                                        CO= NDIR 0.35(    44.3) + 0.65(    47.7) =   46.503   GM/BHP HR
                                        NO2-NDIR 0.35(     4.9) + 0.65(     4.7) =    4.765   GM/BHP HR
                                                            CORRECTED NO2 =    5.168   GM/BHP HR
                                                                     BSFC =     .786   LB/BHP HR


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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID     CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         3104   1.810   12.11     90   14.230    3447     75     886      3    .232    17.4     205      .7     0    13.7
2 30 PCT T      734    .190   13.79    130   14.003   12610     66     346     39    .077     5.1      27     3.0    31     9.0
3 60 PCT T     1885   1.530   13.87    460   15.589   17282    209    3426    169    .147    30.7     504    24.9    63     6.0
4 30 PCT T      227    .240   14.23    150   14.493   12610     20     422     43    .077     1.5      32     3.3    31     9.0
5 10 PCT T       80    .400   14.43     70   14.838   10161      5     553     16    .057      .3      32      .9    10    12.5
6 30 PCT T      198    .230   13.98    160   14.220   12610     18     412     47    .077     1.4      32     3.6    31     9.0
7 90 PCT T      795    .590   14.09   1937   14.760   22045    119    1780    961    .113    13.4     201   108.5    95     2.0
8 30 PCT T      142    .190   14.31    200   14.514   12610     12     333     58    .077      .9      26     4.4    31     9.0
9 C.T.           17   3.100    9.66     15   12.762    3719      0    1825      1    .143      .1     261      .2     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     2.3      43     4.9
1 IDLE         3104   1.810   12.11     90   14.230    3447     75     886      3    .232    17.4     205      .7     0    13.7
2 30 PCT T      368    .250   14.18    140   14.467   12610     32     440     41    .077     2.5      34     3.1    31     9.0
3 60 PCT T     1802   1.870   13.71    300   15.760   17282    198    4142    109    .147    29.0     609    16.1    63     6.0
4 30 PCT T      255    .280   14.31    130   14.616   12610     22     488     37    .077     1.7      38     2.9    31     9.0
5 10 PCT T      513    .560   14.52     60   15.131   10161     34     760     13    .057     2.0      43      .8    10    12.5
6 30 PCT T      255    .270   14.25    140   14.596   12610     22     473     40    .077     1.7      36     3.1    31     9.0
7 90 PCT T      682    .570   14.19   1450   14.828   22045    101    1712    716    .113    11.5     193    80.9    95     2.0
8 30 PCT T      227    .210   14.39     60   14.623   12610     20     366     17    .077     1.5      28     1.3    31     9.0
9 C.T.           13   2.900    9.61     12   12.511    3719      0    1741      1    .143      .1     249      .2     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     2.2      47     3.6
1 IDLE         2791   2.000   13.04     90   15.319    3447     63     909      3    .232    14.6     211      .7     0    13.7
2 30 PCT T      510    .210   14.13    105   14.391   12610     45     372     31    .077     3.4      29     2.4    31     9.0
3 60 PCT T     1745   2.000   13.62    450   15.795   17282    191    4420    163    .147    28.1     650    24.0    63     6.0
4 30 PCT T      341    .250   14.40    160   14.684   12610     29     434     46    .077     2.3      33     3.5    31     9.0
5 10 PCT T      570    .710   14.39     70   15.157   10161     38     951     16    .057     2.2      55      .9    10    12.5
6 30 PCT T      227    .210   14.28    165   14.513   12610     20     369     48    .077     1.5      28     3.7    31     9.0
7 90 PCT T      625    .570   14.13   1700   14.762   22045     93    1719    843    .113    10.5     194    95.2    95     2.0
8 30 PCT T      227    .230   14.39    175   14.643   12610     20     400     50    .077     1.5      31     3.9    31     9.0
9 C.T.        27444   2.690    9.03     15   15.266    3719    669    1329      1    .143    95.6     189      .2     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     5.3      47     4.4
1 IDLE         2791   2.000   13.04     90   15.319    3447     63     909      3    .232    14.6     211      .7     0    13.7
2 30 PCT T      368    .240   14.12    140   14.397   12610     32     425     47    .077     2.5      33     3.6    31     9.0
3 60 PCT T     1716   2.010   13.59    480   15.778   17282    188    4449    175    .147    27.6     654    25.7    63     6.0
4 30 PCT T      341    .340   14.39    155   14.764   12610     29     587     44    .077     2.2      45     3.4    31     9.0
5 10 PCT T      569    .690   14.31     75   15.057   10161     38     941     17    .057     2.2      54     1.0    10    12.5
6 30 PCT T      227    .260   14.28    165   14.563   12610     20     455     47    .077     1.5      35     3.7    31     9.0
7 90 PCT T      653    .570   14.17   1700   14.805   22045     97    1714    840    .113    11.0     194    95.0    95     2.0
8 30 PCT T      227    .240   14.35     70   14.613   12610     20     418     20    .077     1.5      32     1.5    31     9.0
9 C.T.        25878   2.590    9.09     15   15.068    3719    639    1291      1    .143    91.3     185      .2     0    21.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     5.1      47     4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     2.3      45     4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     5.2      47     4.4
FOUR CYCLE COMPOSITE -
                                        HC- FID  0.35(     2.3) + 0.65(     5.2) =    4.159   GM/BHP HR
                                        CO- NDIR 0.35(    45.4) + 0.65(    47.1) =   46.508   GM/BHP HR
                                        NO2-CL   0.35(     4.3) + 0.65(     4.4) =    4.370   GM/BHP HR
                                                            CORRECTED NO2 =    4.739   GM/BHP HR
                                                                     BSFC =     .786   LB/BHP HR
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                  TABLE F-50 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST 65  RUN-4   EGR VALVE 2-1          08-13-73      K =1.064      HUM =101.4  GR/LB
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MODE            CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR          WT.        WEIGHTED GM/HR                MAN.
                  HC       CO      CO2      NO   CARBON    CONS.      HC      CO     NO2   FACT.    HC       CO     NO2     HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE            99    1.700    12.28     109   14.087     3629      28     885      9    .232     6.4     205     2.2     0     19.4
2 30 PCT T        46     .150    13.40     246   13.600    12474      46     278     75    .077     3.5      21     5.8    31     10.9
3 60 PCT T        66     .960    13.49     826   14.521    17282      85    2308    326    .147    12.5     339    48.0    63      6.8
4 30 PCT T        33     .160    13.55     274   13.746    12474      32     293     83    .077     2.5      23     6.4    31     10.9
5 10 PCT T        36     .220    13.67     134   13.929     9616      27     307     31    .057     1.5      17     1.8    10     13.9
6 30 PCT T        32     .180    13.59     287   13.805    12474      31     329     86    .077     2.4      25     6.6    31     10.9
7 90 PCT T        53     .640    13.42    2632   14.117    21591      88    1977   1336    .113     9.9     223   151.0    94      2.6
8 30 PCT T        40     .280    13.61     291   13.933    12474      39     506     86    .077     3.0      39     6.7    31     10.9
9 C.T.          1847    3.190     8.92     106   14.159     3674     532    1672      9    .143    76.0     239     1.3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.9      37     7.6
1 IDLE            99    1.700    12.28     109   14.087     3629      28     885      9    .232     6.4     205     2.2     0     19.4
2 30 PCT T        52     .300    13.62     284   13.976    12474      50     541     84    .077     3.9      42     6.5    31     10.9
3 60 PCT T        67    1.080    13.41     844   14.562    17282      86    2589    352    .147    12.6     381    51.8    63      6.8
4 30 PCT T        40     .290    13.72     322   14.053    12474      38     520     95    .077     3.0      40     7.3    31     10.9
5 10 PCT T        35     .400    13.74     143   14.178     9616      26     548     32    .057     1.5      31     1.8    10     13.9
6 30 PCT T        32     .290    13.67     347   13.995    12474      31     434    103    .077     2.4      33     7.9    31     10.9
7 90 PCT T        43     .620    13.95    2667   14.116    21591      71    1916   1354    .113     8.0     216   153.0    94      2.6
8 30 PCT T        30     .280    13.74     334   14.052    12474      29     502     98    .077     2.2      39     7.6    31     10.9
9 C.T.          1747    3.020     9.11     102   14.017     3674     495    1599      9    .143    70.7     229     1.3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.7      40     7.9
1 IDLE           105    2.650    11.95     107   14.713     3629      28    1320      9    .232     6.5     306     2.0     0     19.4
2 30 PCT T        37     .290    13.61     319   13.940    12474      36     524     95    .077     2.8      40     7.3    31     10.9
3 60 PCT T        62    1.220    13.31     905   14.597    17282      79    2918    356    .147    11.7     429    52.3    63      6.8
4 30 PCT T        37     .380    13.70     304   14.120    12474      35     678     89    .077     2.7      52     6.9    31     10.9
5 10 PCT T        39     .380    13.77     137   14.192     9616      29     520     31    .057     1.6      30     1.8    10     13.9
6 30 PCT T        37     .290    13.70     325   14.030    12474      36     521     96    .077     2.7      40     7.4    31     10.9
7 90 PCT T        47     .530    13.47    2668   14.051    21591      78    1645   1361    .113     8.8     186   153.8    94      2.6
8 30 PCT T        26     .260    13.77     323   14.058    12474      25     466     95    .077     1.9      36     7.3    31     10.9
9 C.T.          1732    2.980     9.15     102   14.001     3674     491    1580      9    .143    70.2     226     1.3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.6      44     7.9
1 IDLE           105    2.650    11.95     107   14.713     3629      28    1320      9    .232     6.5     306     2.0     0     19.4
2 30 PCT T        46     .300    13.56     305   13.910    12474      45     543     91    .077     3.4      42     7.0    31     10.9
3 60 PCT T        63    1.200    13.36     874   14.628    17282      80    2864    345    .147    11.8     421    50.7    63      6.8
4 30 PCT T        38     .330    13.64     273   14.011    12474      37     593     81    .077     2.8      46     6.2    31     10.9
5 10 PCT T        38     .370    13.78     145   14.191     9616      28     506     33    .057     1.6      29     1.9    10     13.9
6 30 PCT T        34     .350    13.64     318   14.032    12474      37     628     94    .077     2.9      48     7.2    31     10.9
7 90 PCT T        53     .650    13.43    2690   14.137    21591      87    2005   1368    .113     9.9     227   154.6    94      2.6
8 30 PCT T        37     .280    13.68     327   14.000    12474      36     504     97    .077     2.7      39     7.4    31     10.9
9 C.T.          1742    2.920     9.08     104   13.881     3674     498    1561      9    .143    71.2     223     1.3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.7      46     7.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     3.8      39     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     3.7      45     7.9
FOUR CYCLE COMPOSITE -
                                  HC- NDIR 0.35(    3.8) + 0.65(    3.7) =    3.704    GM/BHP HR
                                  CO- NDIR 0.35(   38.8) + 0.65(   45.1) =   42.889    GM/BHP HR
                                  NO2-NDIR 0.35(    7.8) + 0.65(    7.9) =    7.855    GM/BHP HR
                                                     CORRECTED NO2 =    8.396    GM/BHP HR
                                                              BSFC =     .783    LB/BHP HR


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MODE            CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR          WT.        WEIGHTED GM/HR                MAN.
                HC-FID      CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL    HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          3219    1.700    12.28      50   14.302     3629      82     871      4    .232    18.9     202     1.0     0     19.4
2 30 PCT T       260     .150    13.40     210   13.576    12474      24     278     64    .077     1.8      21     4.9    31     10.9
3 60 PCT T      1105     .960    13.49     740   14.561    17282     131    2302    292    .147    19.3     338    42.9    63      6.8
4 30 PCT T       141     .160    13.55     240   13.724    12474      13     294     72    .077     1.0      23     5.6    31     10.9
5 10 PCT T       226     .220    13.67      95   13.913     9616      16     307     22    .057      .9      18     1.2    10     13.9
6 30 PCT T       141     .180    13.59     250   13.784    12474      13     329     75    .077     1.0      25     5.8    31     10.9
7 90 PCT T       896     .640    13.42    2600   14.150    21591     137    1973   1317    .113    15.5     223   148.8    94      2.6
8 30 PCT T       169     .280    13.61     240   13.907    12474      15     507     71    .077     1.2      39     5.5    31     10.9
9 C.T.         31136    3.190     8.92      20   15.224     3674     751    1555      2    .143   107.5     222      .2     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.5      37     7.1
1 IDLE          3219    1.700    12.28      50   14.302     3629      82     871      4    .232    18.9     202     1.0     0     19.4
2 30 PCT T       332     .300    13.62     240   13.953    12474      30     542     71    .077     2.3      42     5.5    31     10.9
3 60 PCT T      1049    1.080    13.41     820   14.596    17282     126    2583    322    .147    18.5     380    47.4    63      6.8
4 30 PCT T       263     .290    13.72     280   14.037    12474      24     521     83    .077     1.8      40     6.4    31     10.9
5 10 PCT T       354     .400    13.74     100   14.175     9616      24     548     23    .057     1.4      31     1.3    10     13.9
6 30 PCT T       212     .290    13.67     270   13.931    12474      19     434     80    .077     1.5      33     6.2    31     10.9
7 90 PCT T       919     .620    13.45    2700   14.168    21591     140    1909   1367    .113    15.8     216   154.4    94      2.6
8 30 PCT T       176     .280    13.74     300   14.038    12474      16     503     89    .077     1.2      39     6.8    31     10.9
9 C.T.         30252    3.020     9.11      25   15.168     3674     733    1479      2    .143   104.9     211      .3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.5      39     7.6
1 IDLE          3036    2.650    11.95      50   14.909     3629      74    1303      4    .232    17.2     302      .9     0     19.4
2 30 PCT T       332     .290    13.61     270   13.933    12474      30     524     80    .077     2.3      40     6.2    31     10.9
3 60 PCT T      1311    1.220    13.31     830   14.661    17282     155    2905    325    .147    22.7     427    47.7    63      6.8
4 30 PCT T       318     .380    13.70     270   14.112    12474      28     674     79    .077     2.2      52     6.1    31     10.9
5 10 PCT T       311     .380    13.77     100   14.181     9616      21     520     23    .057     1.2      30     1.3    10     13.9
6 30 PCT T       272     .290    13.70     290   14.017    12474      24     521     86    .077     1.9      40     6.6    31     10.9
7 90 PCT T       749     .530    13.47    2650   14.075    21591     115    1642   1350    .113    13.0     186   152.5    94      2.6
8 30 PCT T       191     .260    13.77     280   14.049    12474      17     466     83    .077     1.3      36     6.4    31     10.9
9 C.T.         28417    2.980     9.15      25   15.022     3674     707    1472      2    .143   101.1     211      .3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.4      44     7.5
1 IDLE          3036    2.650    11.95      50   14.909     3629      74    1303      4    .232    17.2     302      .9     0     19.4
2 30 PCT T       353     .300    13.56     265   13.895    12474      32     544     79    .077     2.4      42     6.1    31     10.9
3 60 PCT T      1235    1.200    13.36     840   14.683    17282     145    2853    328    .147    21.4     419    48.3    63      6.8
4 30 PCT T       279     .330    13.64     280   13.998    12474      25     594     83    .077     1.9      46     6.4    31     10.9
5 10 PCT T       297     .370    13.78      95   14.180     9616      20     507     21    .057     1.1      29     1.2    10     13.9
6 30 PCT T       279     .350    13.64     280   14.018    12474      25     629     83    .077     1.9      48     6.4    31     10.9
7 90 PCT T       947     .650    13.43    2700   14.175    21591     144    2000   1365    .113    16.3     226   154.3    94      2.6
8 30 PCT T       226     .280    13.68     290   13.983    12474      20     505     86    .077     1.6      39     6.6    31     10.9
9 C.T.         30441    2.920     9.08      25   15.044     3674     743    1440      2    .143   106.3     206      .3     0     22.1
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.6      45     7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     5.5      38     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     5.5      44     7.6
FOUR CYCLE COMPOSITE -
                                  HC- FID  0.35(    5.5) + 0.65(    5.5) =    5.507    GM/BHP HR
                                  CO- NDIR 0.35(   38.1) + 0.65(   44.3) =   42.169    GM/BHP HR
                                  NO2-CL   0.35(    7.4) + 0.65(    7.6) =    7.503    GM/BHP HR
                                                     CORRECTED NO2 =    8.019    GM/BHP HR
                                                              BSFC =     .783    LB/BHP HR
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                         TABLE F-51 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST-65  RUN-Y   SIMULATED EGR          08-09-73      K =1.070      HUM =101.8  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE            HC       CO      CO2     NO    CARBON    CONS.      HC       CO     NO2   FACT.    HC       CO     NO2   HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          142   1.880   12.62     170   14.653     3357       35      870     13   .232     8.2     202     3.0    0    19.4
2 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
3 60 PCT T       56   2.050   13.00     585   15.110    17418       70     4773    224   .147    10.2     702    32.9   63     8.2
4 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
5 10 PCT T       30    .440   14.08     313   14.552     8346       19      510     60   .057     1.1      29     3.4   10    16.7
6 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
7 90 PCT T       56   2.210   13.14    1966   15.410    22907       90     6636    723   .113    10.2     750    81.8   95     2.5
8 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
9 C.T.         1754   3.210    9.64     205   14.744     3538      455     1556     16   .143    65.0     222     2.3    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       3.3      65     5.0
1 IDLE          142   1.880   12.62     170   14.653     3357       35      870     13   .232     8.2     202     3.0    0    19.4
2 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
3 60 PCT T       56   2.050   13.00     585   15.110    17418       70     4773    224   .147    10.2     702    32.9   63     8.2
4 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
5 10 PCT T       30    .440   14.08     313   14.552     8346       19      510     60   .057     1.1      29     3.4   10    16.7
6 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
7 90 PCT T       56   2.210   13.14    1966   15.410    22907       90     6636    723   .113    10.2     750    81.8   95     2.5
8 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
9 C.T.         1754   3.210    9.64     205   14.744     3538      455     1556     16   .143    65.0     222     2.3    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       3.3      65     5.0
1 IDLE          142   1.880   12.62     170   14.653     3357       35      870     13   .232     8.2     202     3.0    0    19.4
2 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
3 60 PCT T       56   2.050   13.00     585   15.110    17418       70     4773    224   .147    10.2     702    32.9   63     8.2
4 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
5 10 PCT T       30    .440   14.08     313   14.552     8346       19      510     60   .057     1.1      29     3.4   10    16.7
6 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
7 90 PCT T       56   2.210   13.14    1966   15.410    22907       90     6636    723   .113    10.2     750    81.8   95     2.5
8 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
9 C.T.         1754   3.210    9.64     205   14.744     3538      455     1556     16   .143    65.0     222     2.3    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       3.3      65     5.0
1 IDLE          142   1.880   12.62     170   14.653     3357       35      870     13   .232     8.2     202     3.0    0    19.4
2 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
3 60 PCT T       56   2.050   13.00     585   15.110    17418       70     4773    224   .147    10.2     702    32.9   63     8.2
4 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
5 10 PCT T       30    .440   14.08     313   14.552     8346       19      510     60   .057     1.1      29     3.4   10    16.7
6 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
7 90 PCT T       56   2.210   13.14    1966   15.410    22907       90     6636    723   .113    10.2     750    81.8   95     2.5
8 30 PCT T       19    .130   13.58     304   13.731    12564       19      240     92   .077     1.4      19     7.1   31    13.2
9 C.T.         1754   3.210    9.64     205   14.744     3538      455     1556     16   .143    65.0     222     2.3    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       3.3      65     5.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------       3.3      65     5.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------       3.3      65     5.0
FOUR CYCLE COMPOSITE =                    HC- NDIR 0.35(      3.3) + 0.65(      3.3) =    3.307   GM/BHP HR
                                          CO- NDIR 0.35(     65.2) + 0.65(     65.2) =   65.173   GM/BHP HR
                                          NO2-NDIR 0.35(      5.0) + 0.65(      5.0) =    5.001   GM/BHP HR
                                                              CORRECTED NO2 =    5.349   GM/BHP HR
                                                                       BSFC =     .783   LB/BHP HR


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                 CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE           HC-FID     CO      CO2   NO-CL  CARBON    CONS.      HC       CO     NO2   FACT.  HC-FID     CO   NO2-CL  HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE         3077   1.880   12.62      59   14.808     3357       70      861      4   .232    16.2     200     1.0    0    19.4
2 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
3 60 PCT T     1509   2.050   13.00     600   15.201    17418      173     4745    228   .147    25.4     698    33.6   63     8.2
4 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
5 10 PCT T      289    .440   14.08     225   14.549     8346       17      510     43   .057      .9      29     2.4   10    16.7
6 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
7 90 PCT T     1656   2.210   13.14    1900   15.516    22907      244     6591    686   .113    27.6     745    77.5   95     2.5
8 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
9 C.T.        30657   3.210    9.64      63   15.916     3538      681     1441      5   .143    97.5     206      .7    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       5.6      64     4.7
1 IDLE         3077   1.880   12.62      59   14.808     3357       70      861      4   .232    16.2     200     1.0    0    19.4
2 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
3 60 PCT T     1509   2.050   13.00     600   15.201    17418      173     4745    228   .147    25.4     698    33.6   63     8.2
4 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
5 10 PCT T      289    .440   14.08     225   14.549     8346       17      510     43   .057      .9      29     2.4   10    16.7
6 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
7 90 PCT T     1656   2.210   13.14    1900   15.516    22907      244     6591    686   .113    27.6     745    77.5   95     2.5
8 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
9 C.T.        30657   3.210    9.64      63   15.916     3538      681     1441      5   .143    97.5     206      .7    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       5.6      64     4.7
1 IDLE         3077   1.880   12.62      59   14.808     3357       70      861      4   .232    16.2     200     1.0    0    19.4
2 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
3 60 PCT T     1509   2.050   13.00     600   15.201    17418      173     4745    228   .147    25.4     698    33.6   63     8.2
4 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
5 10 PCT T      289    .440   14.08     225   14.549     8346       17      510     43   .057      .9      29     2.4   10    16.7
6 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
7 90 PCT T     1656   2.210   13.14    1900   15.516    22907      244     6591    686   .113    27.6     745    77.5   95     2.5
8 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
9 C.T.        30657   3.210    9.64      63   15.916     3538      681     1441      5   .143    97.5     206      .7    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       5.6      64     4.7
1 IDLE         3077   1.880   12.62      59   14.808     3357       70      861      4   .232    16.2     200     1.0    0    19.4
2 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
3 60 PCT T     1509   2.050   13.00     600   15.201    17418      173     4745    228   .147    25.4     698    33.6   63     8.2
4 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
5 10 PCT T      289    .440   14.08     225   14.549     8346       17      510     43   .057      .9      29     2.4   10    16.7
6 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
7 90 PCT T     1656   2.210   13.14    1900   15.516    22907      244     6591    686   .113    27.6     745    77.5   95     2.5
8 30 PCT T       42    .130   13.58     300   13.714    12564        4      241     91   .077      .3      19     7.0   31    13.2
9 C.T.        30657   3.210    9.64      63   15.916     3538      681     1441      5   .143    97.5     206      .7    0    22.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------       5.6      64     4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------       5.6      64     4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------       5.6      64     4.7
FOUR CYCLE COMPOSITE =                    HC- FID  0.35(      5.6) + 0.65(      5.6) =    5.559   GM/BHP HR
                                          CO- NDIR 0.35(     64.3) + 0.65(     64.3) =   64.263   GM/BHP HR
                                          NO2-CL   0.35(      4.7) + 0.65(      4.7) =    4.721   GM/BHP HR
                                                              CORRECTED NO2 =    5.049   GM/BHP HR
                                                                       BSFC =     .783   LB/BHP HR
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                    TABLE F-52 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-OP  TEST 76  RUN-1   0 CAT-AIR-EGR 10 PCT. 08-21-73       K =1.072      HUM =103.1  GR/LB
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                 CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE             HC      CO     CO2      NO   CARBON    CONS.      HC      CO     NO2   FACT.   HC         CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE           28    .060   10.21      48   10.300     3266      10      38       5   .232    2.2         9     1.2     0    14.0
2 30 PCT T       33    .060   11.92     212   12.016    12565      37     127      74   .077    2.9        10     5.7    31     9.5
3 60 PCT T       28    .060   13.88     675   13.970    16239      35     141     260   .147    5.2        21    38.3    64     6.2
4 30 PCT T       33    .060   12.18     251   12.276    12565      36     124      85   .077    2.8        10     6.6    31     9.5
5 10 PCT T       33    .060   11.79     135   11.846     9027      27      92      34   .057    1.5         5     1.9    10    13.8
6 30 PCT T       28    .060   12.18     264   12.270    12565      31     124      90   .077    2.4        10     6.9    31     9.5
7 90 PCT T       28    .060   13.73    2081   13.820    22408      49     197    1120   .113    5.5        22   126.6    95     1.9
8 30 PCT T       47    .060   12.45     304   12.561    12565      51     121     101   .077    3.9         9     7.8    31     9.5
9 C.T.           48    .060    8.92      36    9.032     3538      20      47       5   .143    2.9         7      .7     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.0         3     6.4
1 IDLE           28    .060   10.21      48   10.300     3266      10      38       5   .232    2.2         9     1.2     0    14.0
2 30 PCT T       33    .060   12.05     251   12.146    12565      37     125      86   .077    2.8        10     6.6    31     9.5
3 60 PCT T       33    .060   14.03     675   14.126    16239      41     139     258   .147    6.0        20    37.9    64     6.2
4 30 PCT T       37    .060   12.31     304   12.410    12565      40     123     102   .077    3.1         9     7.9    31     9.5
5 10 PCT T       37    .060   11.92     148   12.020     9027      30      91      37   .057    1.7         5     2.1    10    13.8
6 30 PCT T       33    .060   12.18     290   12.276    12565      36     124 [illegible] .077   2.8      10     7.6    31     9.5
7 90 PCT T       37    .060   13.58    2081   13.680    22408      65     194    1132   .113    7.4        22   127.4    95     1.9
8 30 PCT T       42    .060   12.45     331   12.555    12565      45     121     110   .077    3.5         9     8.5    31     9.5
9 C.T.           47    .060    8.82      48    8.931     3538      20      48       6   .143    2.9         7      .9     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.1         3     6.6
1 IDLE           51    .060   11.04      48   11.155     3266      16      35      10   .232    3.7         8     2.2     0    14.0
2 30 PCT T       33    .060   12.18     264   12.276    12565      36     124      90   .077    2.8        10     6.9    31     9.5
3 60 PCT T       33    .060   14.03     690   14.126    16239      41     139     263   .147    6.0        20    38.7    64     6.2
4 30 PCT T       42    .060   12.31     304   12.415    12565      46     123     102   .077    3.5         9     7.9    31     9.5
5 10 PCT T       47    .060   12.05     160   12.161     9027      38      90      39   .057    2.1         5     2.2    10    13.8
6 30 PCT T       47    .060   12.31     317   12.421    12565      51     123     106   .077    4.0         9     8.2    31     9.5
7 90 PCT T       51    .060   13.58    2081   13.695    22408      90     198    1130   .113   10.2        22   127.7    95     1.9
8 30 PCT T       56    .060   12.45     331   12.570    12565      60     121     110   .077    4.7         9     8.5    31     9.5
9 C.T.           56    .060    8.82      61    8.940     3538      24      48       8   .143    3.4         7     1.1     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.3         3     6.7
1 IDLE           51    .060   11.04      48   11.155     3266      16      35      10   .232    3.7         8     2.2     0    14.0
2 30 PCT T       56    .060   12.05     277   12.170    12565      62     125      95   .077    4.8        10     7.3    31     9.5
3 60 PCT T       42    .060   14.03     629   14.135    16239      52     139     240   .147    7.7        20    35.3    64     6.2
4 30 PCT T       37    .060   12.05     290   12.150    12565      41     125     100   .077    3.2        10     7.7    31     9.5
5 10 PCT T       37    .060   11.92     135   12.020     9027      30      91      34   .057    1.7         5     1.9    10    13.8
6 30 PCT T       37    .060   12.31     290   12.410    12565      40     123      97   .077    3.1         9     7.5    31     9.5
7 90 PCT T       37    .060   13.58    2035   13.680    22408      65     199    1107   .113    7.4        22   125.1    95     1.9
8 30 PCT T       42    .060   12.45     304   12.555    12565      45     121     101   .077    3.5         9     7.8    31     9.5
9 C.T.           42    .060    8.82      36    8.925     3538      18      48       5   .143    2.6         7      .7     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------   1.2         3     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------   1.0         3     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------   1.3         3     6.6
FOUR CYCLE COMPOSITE -                       HC- NDIR 0.35(    1.0) + 0.65(    1.3) =    1.193   GM/BHP HR
                                             CO- NDIR 0.35(    3.4) + 0.65(    3.3) =    3.339   GM/BHP HR
                                             NO2-NDIR 0.35(    6.5) + 0.65(    6.6) =    6.552   GM/BHP HR
                                                               CORRECTED NO2 =    7.026   GM/BHP HR
                                                                        BSFC =     .767   LB/BHP HR
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                 CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID     CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2   FACT.  HC-FID      CO  NO2-CL    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE          107    .060   10.21      40   10.281     3266       3      39       4   .232     .8         9     1.0     0    14.0
2 30 PCT T      104    .060   11.92     206   11.990    12565      11     127      72   .077     .8        10     5.5    31     9.5
3 60 PCT T      100    .060   13.88     650   13.950    16239      12     141     251   .147    1.7        21    36.9    64     6.2
4 30 PCT T       94    .060   12.18     230   12.249    12565      10     124      78   .077     .7        10     6.0    31     9.5
5 10 PCT T       93    .060   11.79     115   11.859     9027       7      92      29   .057     .4         5     1.7    10    13.8
6 30 PCT T       96    .060   12.18     235   12.250    12565      10     124      80   .077     .8        10     6.2    31     9.5
7 90 PCT T       97    .060   13.73    2062   13.800    22408      16     197    1112   .113    1.8        22   125.6    95     1.9
8 30 PCT T       94    .060   12.45     300   12.519    12565       9     122     100   .077     .7         9     7.7    31     9.5
9 C.T.          132    .060    8.92      21    8.993     3538       5      48       3   .143     .7         7      .4     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    .3         3     6.3
1 IDLE          107    .060   10.21      40   10.281     3266       3      39       4   .232     .8         9     1.0     0    14.0
2 30 PCT T       98    .060   12.05     230   12.120    12565      10     126      79   .077     .8        10     6.1    31     9.5
3 60 PCT T       95    .060   14.03     635   14.099    16239      11     140     243   .147    1.6        21    35.7    64     6.2
4 30 PCT T       92    .060   12.31     280   12.379    12565       9     123      94   .077     .7         9     7.3    31     9.5
5 10 PCT T       92    .060   11.92     130   11.989     9027       7      91      32   .057     .4         5     1.9    10    13.8
6 30 PCT T       92    .060   12.18     270   12.249    12565       9     124      92   .077     .7        10     7.1    31     9.5
7 90 PCT T       95    .060   13.58    2075   13.649    22408      16     199    1131   .113    1.8        22   127.8    95     1.9
8 30 PCT T       93    .060   12.45     313   12.519    12565       9     122     104   .077     .7         9     8.0    31     9.5
9 C.T.          124    .060    8.82      20    8.893     3538       5      48       3   .143     .7         7      .4     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    .3         3     6.4
1 IDLE           88    .060   11.04      43   11.109     3266       3      36       4   .232     .6         8     1.0     0    14.0
2 30 PCT T       92    .060   12.18     240   12.249    12565       9     124      82   .077     .7        10     6.3    31     9.5
3 60 PCT T       92    .060   14.03     660   14.099    16239      11     140     252   .147    1.6        21    37.1    64     6.2
4 30 PCT T       87    .060   12.31     270   12.379    12565       9     123      91   .077     .7         9     7.0    31     9.5
5 10 PCT T       87    .060   12.05     130   12.119     9027       6      90      32   .057     .4         5     1.8    10    13.8
6 30 PCT T       87    .060   12.31     275   12.379    12565       9     123      93   .077     .7         9     7.1    31     9.5
7 90 PCT T       90    .060   13.58    2050   13.649    22408      15     199    1117   .113    1.7        22   126.3    95     1.9
8 30 PCT T       87    .060   12.45     300   12.519    12565       9     122     100   .077     .7         9     7.7    31     9.5
9 C.T.          129    .060    8.82      18    8.893     3538       5      48       2   .143     .7         7      .3     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    .3         3     6.4
1 IDLE           88    .060   11.04      43   11.109     3266       3      36       4   .232     .6         8     1.0     0    14.0
2 30 PCT T       89    .060   12.05     225   12.119    12565       8     126      77   .077     .7        10     6.0    31     9.5
3 60 PCT T       88    .060   14.03     610   14.099    16239      10     140     233   .147    1.5        21    34.3    64     6.2
4 30 PCT T       87    .060   12.05     270   12.119    12565       9     126      93   .077     .7        10     7.2    31     9.5
5 10 PCT T       86    .060   11.92     120   11.989     9027       6      91      30   .057     .4         5     1.7    10    13.8
6 30 PCT T       86    .060   12.31     270   12.379    12565       9     123      91   .077     .7         9     7.0    31     9.5
7 90 PCT T       90    .060   13.58    2025   13.649    22408      15     199    1104   .113    1.7        22   124.7    95     1.9
8 30 PCT T       86    .060   12.45     300   12.519    12565       9     122     100   .077     .7         9     7.7    31     9.5
9 C.T.          122    .060    8.82      19    8.892     3538       5      48       3   .143     .7         7      .4     0    22.1
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    .2         3     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    .3         3     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    .3         3     6.3
FOUR CYCLE COMPOSITE -                       HC- FID  0.35(     .3) + 0.65(     .3) =     .260   GM/BHP HR
                                             CO- NDIR 0.35(    3.4) + 0.65(    3.3) =    3.348   GM/BHP HR
                                             NO2-CL   0.35(    6.4) + 0.65(    6.3) =    6.342   GM/BHP HR
                                                               CORRECTED NO2 =    6.800   GM/BHP HR
                                                                        BSFC =     .767   LB/BHP HR
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                         TABLE F-55 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-UP  TEST 76  RUN=2   0 CAT-AIR-EGR 10 PCT. 08-21-73        K =1.080      HUM =107.1  GR/LB
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                  CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR             MAN.
MODE              HC      CO     CO2      NO   CARBON   CONS.     HC      CO     NO2    FACT.   HC        CO    NO2     HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE            40    .080   10.44      72   10.563    3266     13      50       7    .232    3.1       12     1.7     0    14.0
2 30 PCT T        38    .080   12.05     277   12.171   12565     42     167      95    .077    3.3       13     7.3    31     9.5
3 60 PCT T        37    .080   14.18     735   14.300   16239     45     184     277    .147    6.7       27    40.7    64     6.2
4 30 PCT T        39    .080   12.18     349   12.302   12565     43     165     117    .077    3.3       13     9.0    31     9.5
5 10 PCT T        39    .080   11.66     173   11.782    9027     32     124      44    .057    1.8        7     2.5    10    13.8
6 30 PCT T        36    .080   12.31     385   12.429   12565     39     163     129    .077    3.0       13     9.9    31     9.5
7 90 PCT T        40    .080   13.73    2270   13.853   22408     70     261    1219    .113    7.9       30   137.8    95     1.9
8 30 PCT T        39    .080   12.45     357   12.572   12565     42     162     118    .077    3.2       12     9.1    31     9.5
9 C.T.            60    .080    9.02      61    9.165    3538     25      62       8    .143    3.6        9     1.1     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.2        4     7.2
1 IDLE            40    .080   10.04      72   10.163    3266     14      52       8    .232    3.2       12     1.8     0    14.0
2 30 PCT T        39    .080   12.05     330   12.172   12565     43     167     113    .077    3.3       13     8.7    31     9.5
3 60 PCT T        36    .080   14.18     674   14.299   16239     44     184     254    .147    6.5       27    37.4    64     6.2
4 30 PCT T        39    .080   12.31     385   12.432   12565     43     163     129    .077    3.3       13     9.9    31     9.5
5 10 PCT T        38    .080   11.92     185   12.041    9027     31     121      46    .057    1.8        7     2.6    10    13.8
6 30 PCT T        37    .080   12.31     371   12.430   12565     40     163     125    .077    3.1       13     9.6    31     9.5
7 90 PCT T        38    .080   13.73    2246   13.851   22408     66     261    1206    .113    7.5       30   136.3    95     1.9
8 30 PCT T        37    .080   12.18     399   12.300   12565     41     165     135    .077    3.1       13    10.4    31     9.5
9 C.T.            40    .080    8.92      73    9.043    3538     17      63       9    .143    2.4        9     1.4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.1        4     7.2
1 IDLE            40    .080   10.92      97   11.043    3266     13      48      10    .232    3.0       11     2.2     0    14.0
2 30 PCT T        38    .080   12.05     330   12.171   12565     42     167     113    .077    3.3       13     8.7    31     9.5
3 60 PCT T        38    .080   14.18     674   14.301   16239     47     183     254    .147    6.9       27    37.4    64     6.2
4 30 PCT T        37    .080   12.45     412   12.570   12565     40     162     137    .077    3.1       12    10.5    31     9.5
5 10 PCT T        39    .080   11.79     198   11.918    9027     32     122      50    .057    1.8        7     2.6    10    13.8
6 30 PCT T        38    .080   12.31     385   12.431   12565     41     163     129    .077    3.2       13     9.9    31     9.5
7 90 PCT T        40    .080   14.03    2151   14.153   22408     68     256    1131    .113    7.7       29   127.8    95     1.9
8 30 PCT T        40    .080   12.45     385   12.573   12565     43     161     128    .077    3.3       12     9.8    31     9.5
9 C.T.            35    .080    8.82      61    8.938    3538     15      64       8    .143    2.1        9     1.1     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.1        4     6.9
1 IDLE            40    .080   10.92      97   11.043    3266     13      48      10    .232    3.0       11     2.2     0    14.0
2 30 PCT T        36    .080   12.05     330   12.169   12565     40     167     113    .077    3.1       13     8.7    31     9.5
3 60 PCT T        38    .080   14.03     735   14.151   16239     47     185     280    .147    6.9       27    41.2    64     6.2
4 30 PCT T        39    .080   12.31     385   12.432   12565     43     163     129    .077    3.3       13     9.9    31     9.5
5 10 PCT T        37    .080   11.79     198   11.910    9027     30     122      50    .057    1.7        7     2.6    10    13.8
6 30 PCT T        36    .080   12.31     385   12.429   12565     39     163     129    .077    3.0       13     9.9    31     9.5
7 90 PCT T        39    .080   14.33    2018   14.452   22408     65     251    1036    .113    7.4       28   117.0    95     1.9
8 30 PCT T        34    .080   12.31     385   12.427   12565     37     163     129    .077    2.9       13    10.0    31     9.5
9 C.T.            30    .080    8.72      72    8.832    3538     13      65      10    .143    1.9        9     1.4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.1        4     6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    1.2        4     7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    1.1        4     6.8
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     1.2) + 0.65(     1.1) =     1.127   GM/BHP HR
                                        CO- NDIR 0.35(     4.4) + 0.65(     4.4) =     4.412   GM/BHP HR
                                        NO2-NDIR 0.35(     7.2) + 0.65(     6.8) =     6.947   GM/BHP HR
                                                            CORRECTED NO2 =     7.501   GM/BHP HR
                                                                     BSFC =      .767   LB/BHP HR
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR             MAN.
MODE             HC-FID    CO     CO2   NO-CL  CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL   HP     VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE           121    .080   10.44      45   10.532    3266      4      50       5    .232     .9       12     1.1     0    14.0
2 30 PCT T       110    .080   12.05     250   12.141   12565     11     167      86    .077     .9       13     6.6    31     9.5
3 60 PCT T       111    .080   14.18     700   14.271   16239     13     184     264    .147    1.9       27    38.9    64     6.2
4 30 PCT T       100    .080   12.18     310   12.270   12565     10     165     105    .077     .8       13     8.1    31     9.5
5 10 PCT T       100    .080   11.66     130   11.750    9027      8     124      33    .057     .4        7     1.9    10    13.8
6 30 PCT T       105    .080   12.31     350   12.400   12565     11     164     118    .077     .8       13     9.1    31     9.5
7 90 PCT T       111    .080   13.73    2225   13.821   22408     18     262    1198    .113    2.0       30   135.3    95     1.9
8 30 PCT T        85    .080   12.45     325   12.538   12565      8     162     106    .077     .7       12     8.3    31     9.5
9 C.T.           145    .080    9.02      20    9.115    3538      6      63       3    .143     .8        9      .4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .3        4     6.9
1 IDLE           120    .080   10.04      45   10.132    3266      4      52       5    .232     .9       12     1.1     0    14.0
2 30 PCT T       105    .080   12.05     285   12.140   12565     11     167      98    .077     .8       13     7.5    31     9.5
3 60 PCT T        98    .080   14.18     630   14.270   16239     11     184     238    .147    1.6       27    35.0    64     6.2
4 30 PCT T        95    .080   12.31     350   12.399   12565     10     164     118    .077     .7       13     9.1    31     9.5
5 10 PCT T        93    .080   11.92     130   12.009    9027      7     121      32    .057     .4        7     1.8    10    13.8
6 30 PCT T        97    .080   12.31     340   12.400   12565     10     164     119    .077     .8       13     8.8    31     9.5
7 90 PCT T        96    .080   13.73    2337   13.880   22408     16     262    1258    .113    1.8       30   142.2    95     1.9
8 30 PCT T        87    .080   12.18     375   12.269   12565      9     166     128    .077     .7       13     9.8    31     9.5
9 C.T.           121    .080    8.92      22    9.012    3538      5      63       3    .143     .7        9      .4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .3        4     7.1
1 IDLE            76    .080   10.98      42   11.008    3266      2      48       4    .232     .5       11     1.0     0    14.0
2 30 PCT T        98    .080   12.05     280   12.190   12565     10     167      96    .077     .8       13     7.4    31     9.5
3 60 PCT T        97    .080   14.18     640   14.270   16239     11     184     242    .147    1.6       27    35.5    64     6.2
4 30 PCT T        81    .080   12.45     360   12.538   12565      8     162     120    .077     .6       12     9.2    31     9.5
5 10 PCT T        77    .080   11.79     180   11.878    9027      6     123      38    .057     .3        7     2.2    10    13.8
6 30 PCT T        76    .080   12.31     350   12.398   12565      8     164     118    .077     .6       13     9.1    31     9.5
7 90 PCT T        78    .080   14.03    2175   14.118   22408     12     256    1146    .113    1.4       29   129.5    95     1.9
8 30 PCT T        69    .080   12.45     375   12.537   12565      7     162     125    .077     .5       12     9.6    31     9.5
9 C.T.           106    .080    8.82      20    8.911    3538      4      64       3    .143     .6        9      .4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .2        4     6.7
1 IDLE            76    .080   10.92      42   11.008    3266      2      48       4    .232     .5       11     1.0     0    14.0
2 30 PCT T        67    .080   12.05     240   12.137   12565      7     167     100    .077     .5       13     7.7    31     9.5
3 60 PCT T        84    .080   14.03     680   14.118   16239     10     186     260    .147    1.4       27    38.2    64     6.2
4 30 PCT T        89    .080   12.31     320   12.399   12565      9     164     108    .077     .7       13     8.3    31     9.5
5 10 PCT T        85    .080   11.79     130   11.879    9027      6     123      33    .057     .4        7     1.9    10    13.8
6 30 PCT T        85    .080   12.31     330   12.398   12565      9     164     111    .077     .7       13     8.5    31     9.5
7 90 PCT T        93    .080   14.33    1962   14.419   22408     14     251    1012    .113    1.6       28   114.4    95     1.9
8 30 PCT T        77    .080   12.31     362   12.398   12565      8     164     122    .077     .6       13     9.4    31     9.5
9 C.T.           109    .080    8.72      20    8.811    3538      4      65       3    .143     .6        9      .4     0    22.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .2        4     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     .3        4     7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     .2        4     6.5
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      .3) + 0.65(      .2) =      .252   GM/BHP HR
                                        CO- NDIR 0.35(     4.5) + 0.65(     4.4) =     4.424   GM/BHP HR
                                        NO2-CL   0.35(     7.0) + 0.65(     6.5) =     6.664   GM/BHP HR
                                                            CORRECTED NO2 =     7.196   GM/BHP HR
                                                                     BSFC =      .767   LB/BHP HR
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                        TABLE F-54 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-1P  TEST 68  RUN-1   R&D CAT-AIR-64         08-15-73     K =1.076     HUM =104.8  GR/LB
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MODE          CONCENTRATION AS MEASURED    TOTAL   FUEL     CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
               HC     CO    CO2     NO    CARBON   CONS.    HC     CO    NO2    FACT.   HC     CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE         18   .030  10.92     65   10.969    3402      6     19      7    .232    1.4     4    1.6     0   14.2
2 30 PCT T     19   .050  12.31     61   12.381   12111     20     99     20    .077    1.5     8    1.5    29   13.5
3 60 PCT T     16   .040  12.31     34   12.367   16420     23    107     15    .147    3.4    16    2.2    59    8.3
4 30 PCT T     18   .030  12.18     20   12.229   12111     19     60      7    .077    1.5     5     .5    29   13.5
5 10 PCT T     19   .040  11.04     26   11.101    8891     16     65      7    .057     .9     4     .4    10   16.9
6 30 PCT T     22   .040  11.92     29   11.984   12111     24     82     10    .077    1.8     6     .7    29   13.5
7 90 PCT T     15   .160  12.05     20   12.226   22000     29    582     42    .113    3.3    66    4.7    88    2.8
8 30 PCT T     21   .040  11.53     52   11.593   12111     24     84     18    .077    1.8     6    1.4    29   13.5
9 C.T.         19   .040   7.48     44    7.541    3720     10     40      7    .143    1.4     6    1.0     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .6     4     .5
1 IDLE         18   .030  10.92     65   10.969    3402      6     19      7    .232    1.4     4    1.6     0   14.2
2 30 PCT T     16   .030  11.04     50   11.087   12111     19     66     18    .077    1.5     5    1.4    29   13.5
3 60 PCT T     20   .030  11.41     13   11.462   16420     31     87      6    .147    4.5    13     .9    59    8.3
4 30 PCT T     18   .040  11.41     19   11.469   12111     21     85      7    .077    1.6     7     .5    29   13.5
5 10 PCT T     17   .030  10.56     16   10.608    8891     15     51      4    .057     .9     3     .3    10   16.9
6 30 PCT T     16   .030  11.41     21   11.457   12111     18     64      7    .077    1.4     5     .6    29   13.5
7 90 PCT T     22   .030  12.05     33   12.104   22000     43    110     20    .113    4.9    12    2.3    88    2.8
8 30 PCT T     19   .030  11.04     31   11.091   12111     22     66     11    .077    1.7     5     .9    29   13.5
9 C.T.         21   .040   7.68     30    7.743    3720     11     39      5    .143    1.6     6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .7     2     .3
1 IDLE         22   .070   9.99     56   10.084    3402      8     48      6    .232    1.9    11    1.5     0   14.2
2 30 PCT T     24   .030  11.41     43   11.466   12111     27     64     15    .077    2.1     5    1.2    29   13.5
3 60 PCT T     24   .030  11.28     11   11.336   16420     38     88      5    .147    5.5    13     .8    59    8.3
4 30 PCT T     25   .040  11.28     12   11.347   12111     29     86      4    .077    2.2     7     .3    29   13.5
5 10 PCT T     27   .030  10.44     18   10.499    8891     25     51      5    .057    1.4     3     .3    10   16.9
6 30 PCT T     26   .030  11.53     16   11.588   12111     29     63      6    .077    2.3     5     .4    29   13.5
7 90 PCT T     25   .030  12.05     33   12.107   22000     49    110     20    .113    5.5    12    2.2    88    2.8
8 30 PCT T     26   .030  11.28     29   11.338   12111     30     65     10    .077    2.3     5     .8    29   13.5
9 C.T.         18   .040   7.62     31    7.679    3720      9     39      5    .143    1.3     6     .7     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .9     2     .3
1 IDLE         22   .070   9.99     56   10.084    3402      8     48      6    .232    1.9    11    1.5     0   14.2
2 30 PCT T     17   .030  11.66     45   11.708   12111     19     63     15    .077    1.5     5    1.2    29   13.5
3 60 PCT T     17   .030  11.53      9   11.578   16420     26     86      4    .147    3.8    13     .6    59    8.3
4 30 PCT T     16   .040  11.16     12   11.217   12111     19     87      4    .077    1.4     7     .3    29   13.5
5 10 PCT T     12   .040  10.56     14   10.613    8891     11     68      4    .057     .6     4     .2    10   16.9
6 30 PCT T     12   .030  11.10     18   11.143   12111     14     66      6    .077    1.1     5     .5    29   13.5
7 90 PCT T     25   .040  12.05     26   12.117   22000     49    147     16    .113    5.5    17    1.8    88    2.8
8 30 PCT T     27   .030  11.28     34   11.339   12111     31     65     12    .077    2.4     5     .9    29   13.5
9 C.T.         25   .040   7.75     49    7.817    3720     13     38      8    .143    1.8     5    1.1     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .7     3     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     .6     3     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     .8     2     .3
FOUR CYCLE COMPOSITE =
                                    HC- NDIR 0.35(      .6) + 0.65(      .8) =    .738   GM/BHP HR
                                    CO- NDIR 0.35(     3.2) + 0.65(     2.4) =   2.690   GM/BHP HR
                                    NO2-NDIR 0.35(      .4) + 0.65(      .3) =    .330   GM/BHP HR
                                                          CORRECTED NO2 =    .355   GM/BHP HR
                                                                   BSFC =    .814   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED    TOTAL   FUEL     CALCULATED GM/HR      WT.      WEIGHTED GM/HR          MAN.
             HC-FID   CO    CO2   NO-CL   CARBON   CONS.    HC     CO    NO2    FACT.  HC-FID   CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE        222   .030  10.92     11   10.972    3402      7     19      1    .232    1.6     4     .3     0   14.2
2 30 PCT T    159   .050  12.31     71   12.375   12111     15     99     24    .077    1.2     8    1.8    29   13.5
3 60 PCT T    119   .040  12.31     20   12.361   16420     15    107      9    .147    2.2    16    1.3    59    8.3
4 30 PCT T    105   .030  12.18     26   12.220   12111     10     60      9    .077     .8     5     .7    29   13.5
5 10 PCT T    100   .040  11.04     19   11.090    8891      8     65      4    .057     .5     4     .2    10   16.9
6 30 PCT T     98   .040  11.92     28   11.970   12111     10     82      9    .077     .8     6     .7    29   13.5
7 90 PCT T     83   .160  12.05     39   12.218   22000     15    582     20    .113    1.7    66    2.3    88    2.8
8 30 PCT T     31   .040  11.53     25   11.573   12111      3     85      9    .077     .2     7     .7    29   13.5
9 C.T.         60   .040   7.48      5    7.526    3720      3     40      1    .143     .4     6     .1     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .3     4     .3
1 IDLE        222   .030  10.92     11   10.972    3402      7     19      1    .232    1.6     4     .3     0   14.2
2 30 PCT T     69   .030  11.04     26   11.077   12111      8     66      9    .077     .6     5     .7    29   13.5
3 60 PCT T     83   .030  11.41     17   11.448   16420     12     87      6    .147    1.7    13     .8    59    8.3
4 30 PCT T     55   .040  11.41     16   11.456   12111      6     85      6    .077     .5     7     .4    29   13.5
5 10 PCT T     44   .030  10.56      9   10.594    8891      4     51      3    .057     .2     3     .1    10   16.9
6 30 PCT T     55   .030  11.41     23   11.446   12111      6     64      8    .077     .5     5     .6    29   13.5
7 90 PCT T     70   .030  12.05     28   12.087   22000     13    110     17    .113    1.4    12    1.9    88    2.8
8 30 PCT T     18   .030  11.04     25   11.072   12111      2     66      9    .077     .1     5     .7    29   13.5
9 C.T.         33   .040   7.68      4    7.723    3720      2     39      1    .143     .2     6     .1     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .2     2     .2
1 IDLE         30   .070   9.99      2   10.063    3402      1     48      0    .232     .2    11     .1     0   14.2
2 30 PCT T     62   .030  11.41     32   11.446   12111      7     64     11    .077     .5     5     .9    29   13.5
3 60 PCT T     83   .030  11.28      9   11.318   16420     12     88      9    .147    1.8    13     .6    59    8.3
4 30 PCT T     62   .040  11.28     14   11.326   12111      7     86      5    .077     .5     7     .4    29   13.5
5 10 PCT T     42   .030  10.44      9   10.474    8891      4     51      3    .057     .2     3     .1    10   16.9
6 30 PCT T     49   .030  11.53     23   11.565   12111      5     63      8    .077     .4     5     .6    29   13.5
7 90 PCT T     66   .030  12.05     28   12.087   22000     12    110     17    .113    1.3    12    1.9    88    2.8
8 30 PCT T     18   .030  11.28     24   11.312   12111      2     65      9    .077     .1     5     .7    29   13.5
9 C.T.         36   .040   7.62      6    7.664    3720      2     39      1    .143     .3     6     .1     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .2     2     .2
1 IDLE         30   .070   9.99      2   10.063    3402      1     48      0    .232     .2    11     .1     0   14.2
2 30 PCT T     65   .030  11.66     35   11.697   12111      7     63     12    .077     .5     5     .9    29   13.5
3 60 PCT T     90   .030  11.53     12   11.569   16420     13     86      6    .147    1.9    13     .8    59    8.3
4 30 PCT T     73   .040  11.16     12   11.207   12111      8     87      4    .077     .6     7     .3    29   13.5
5 10 PCT T     43   .040  10.56      7   10.604    8891      4     68      2    .057     .2     4     .1    10   16.9
6 30 PCT T     52   .030  11.10     20   11.135   12111      6     66      7    .077     .4     5     .6    29   13.5
7 90 PCT T     71   .040  12.05     26   12.097   22000     13    147     16    .113    1.5    17    1.8    88    2.8
8 30 PCT T     14   .030  11.28     28   11.311   12111      2     65     10    .077     .1     5     .8    29   13.5
9 C.T.         30   .040   7.75     20    7.793    3720      1     39      3    .143     .2     6     .5     0   22.3
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .2     3     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------     .3     3     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------     .2     2     .2
FOUR CYCLE COMPOSITE =
                                    HC- FID  0.35(      .3) + 0.65(      .2) =    .227   GM/BHP HR
                                    CO- NDIR 0.35(     3.2) + 0.65(     2.4) =   2.694   GM/BHP HR
                                    NO2-CL   0.35(      .2) + 0.65(      .2) =    .213   GM/BHP HR
                                                          CORRECTED NO2 =    .230   GM/BHP HR
                                                                   BSFC =    .814   LB/BHP HR
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                   TABLE F-55 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-1P  TEST-68  RUN-2   R+D CAT-AIR-69          08-15-73      K =1.072      HUM =102.9  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE             HC      CO     CO2     NO   CARBON    CONS.      HC      CO     NO2    FACT.   HC        CO    NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE           25    .040    9.86     61    9.927     3402       9      28       7    .232    2.1        6    1.6     0    14.2
2 30 PCT T       26    .040   11.58    110   11.648    12111      29      84      38    .077    2.2        6    2.9    29    13.5
3 60 PCT T       26    .040   11.84     93   11.908    16420      39     111      43    .147    5.7       16    6.3    59     8.3
4 30 PCT T       26    .030   11.25     55   11.308    12111      30      65      20    .077    2.3        5    1.5    29    13.5
5 10 PCT T       27    .040   11.04     49   11.109     8891      23      65      13    .057    1.3        4     .7    10    16.9
6 30 PCT T       28    .100   11.31     54   11.440    12111      32     214      19    .077    2.5       16    1.5    29    13.5
7 90 PCT T       25    .010   12.76     65   12.797    22000      46      35      37    .113    5.2        4    4.2    88     2.8
8 30 PCT T       24    .050   10.94     45   11.016    12111      28     111      16    .077    2.2        9    1.3    29    13.5
9 C.T.           23    .040    7.48     25    7.545     3720      12      40       4    .143    1.8        6     .6     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .9        3     .7
1 IDLE           25    .040    9.86     61    9.927     3402       9      28       7    .232    2.1        6    1.6     0    14.2
2 30 PCT T       20    .040   11.43     59   11.492    12111      23      85      21    .077    1.8        7    1.6    29    13.5
3 60 PCT T       26    .040   11.50     41   11.568    16420      40     115      19    .147    5.9       17    2.8    59     8.3
4 30 PCT T       25    .030   10.97     39   11.027    12111      30      67      14    .077    2.3        5    1.1    29    13.5
5 10 PCT T       23    .030   10.83     35   10.885     8891      20      49       9    .057    1.2        3     .5    10    16.9
6 30 PCT T       25    .010   10.87     58   10.907    12111      30      22      21    .077    2.3        2    1.6    29    13.5
7 90 PCT T       19    .010   12.00     49   12.031    22000      38      37      30    .113    4.2        4    3.4    88     2.8
8 30 PCT T       25    .040   11.18     58   11.297    12111      29      87      21    .077    2.2        7    1.6    29    13.5
9 C.T.           25    .030    7.48     25    7.537     3720      13      30       4    .143    1.9        4     .6     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .8        2     .5
1 IDLE           16    .050   10.34     28   10.407     3402       6      33       3    .232    1.3        8     .7     0    14.2
2 30 PCT T       26    .030   11.15     62   11.208    12111      30      65      22    .077    2.3        5    1.7    29    13.5
3 60 PCT T       25    .030   11.14     34   11.197    16420      40      89      17    .147    5.8       13    2.4    59     8.3
4 30 PCT T       17    .020   10.93     43   10.968    12111      20      45      16    .077    1.6        3    1.2    29    13.5
5 10 PCT T       13    .030   10.74     32   10.784     8891      12      50       9    .057     .7        3     .5    10    16.9
6 30 PCT T       17    .050   11.10     44   11.168    12111      20     110      16    .077    1.5        8    1.2    29    13.5
7 90 PCT T       25    .010   11.48     44   11.517    22000      52      39      28    .113    5.8        4    3.2    88     2.8
8 30 PCT T       19    .040   11.04     42   11.101    12111      22      88      15    .077    1.7        7    1.2    29    13.5
9 C.T.           11    .030    7.75     20    7.792     3720       6      29       3    .143     .8        4     .5     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .8        2     .4
1 IDLE           16    .050   10.34     28   10.407     3402       6      33       3    .232    1.3        8     .7     0    14.2
2 30 PCT T       22    .030   11.13     59   11.184    12111      26      66      21    .077    2.0        5    1.6    29    13.5
3 60 PCT T       20    .030   11.25     37   11.302    16420      31      88      18    .147    4.6       13    2.6    59     8.3
4 30 PCT T       16    .030   10.93     40   10.977    12111      19      67      15    .077    1.5        5    1.1    29    13.5
5 10 PCT T       17    .030   11.22     42   11.268     8891      14      48      11    .057     .8        3     .6    10    16.9
6 30 PCT T       24    .070   11.56     58   11.686    12111      27     147      20    .077    2.1       11    1.5    29    13.5
7 90 PCT T       26    .010   12.18     84   12.218    22000      51      36      50    .113    5.7        4    5.7    88     2.8
8 30 PCT T       27    .030    9.45     54    9.509    12111      37      77      23    .077    2.9        6    1.8    29    13.5
9 C.T.           24    .030    7.75     21    7.806     3720      12      29       3    .143    1.8        4     .5     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .8        2     .6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------   .9        2     .6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------   .8        2     .5
FOUR CYCLE COMPOSITE -                HC- NDIR 0.35(      .9) + 0.65(      .8) =    .811   GM/BHP HR
                                      CO- NDIR 0.35(     2.2) + 0.65(     2.0) =   2.103   GM/BHP HR
                                      NO2-NDIR 0.35(      .6) + 0.65(      .5) =    .548   GM/BHP HR
                                                            CORRECTED NO2 =    .588   GM/BHP HR
                                                                     BSFC =    .819   LB/BHP HR
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               CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR           MAN.
MODE          HC-FID     CO     CO2  NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE          198    .040    9.86     29    9.920     3402       7      28       3    .232    1.6        6     .8     0    14.2
2 30 PCT T      173    .040   11.58    110   11.637    12111      18      84      38    .077    1.4        6    2.9    29    13.5
3 60 PCT T      125    .040   11.84     85   11.893    16420      17     112      39    .147    2.5       16    5.7    59     8.3
4 30 PCT T      128    .030   11.25     35   11.293    12111      14      65      12    .077    1.1        5    1.0    29    13.5
5 10 PCT T      114    .040   11.04     20   11.091     8891       9      65       5    .057     .5        4     .3    10    16.9
6 30 PCT T      107    .100   11.31     26   11.421    12111      11     214       9    .077     .9       16     .7    29    13.5
7 90 PCT T      105    .010   12.76     19   12.781    22000      18      35      11    .113    2.0        4    1.2    88     2.8
8 30 PCT T       45    .050   10.94     15   10.995    12111       5     111       5    .077     .4        9     .4    29    13.5
9 C.T.           33    .040    7.48      1    7.529     3720       2      40       0    .143     .2        6     .0     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .4        3     .5
1 IDLE          198    .040    9.86     29    9.920     3402       7      28       3    .232    1.6        6     .8     0    14.2
2 30 PCT T       43    .040   11.43     34   11.479    12111      10      85      12    .077     .8        7     .9    29    13.5
3 60 PCT T      104    .040   11.50     13   11.550    16420      15     115       6    .147    2.2       17     .9    59     8.3
4 30 PCT T       79    .030   10.97     16   11.008    12111       9      67       6    .077     .7        5     .5    29    13.5
5 10 PCT T       55    .030   10.83      9   10.866     8891       5      50       2    .057     .3        3     .1    10    16.9
6 30 PCT T       28    .010   10.87     26   10.883    12111       3      22      10    .077     .2        2     .7    29    13.5
7 90 PCT T       73    .010   12.00     23   12.017    22000      13      37      14    .113    1.5        4    1.6    88     2.8
8 30 PCT T       24    .040   11.18     26   11.222    12111       3      87       9    .077     .2        7     .7    29    13.5
9 C.T.           20    .030    7.48      2    7.512     3720       1      30       0    .143     .1        4     .0     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .3        2     .2
1 IDLE           69    .050   10.34     29   10.397     3402       2      33       3    .232     .5        8     .7     0    14.2
2 30 PCT T       70    .030   11.15     34   11.187    12111       8      66      12    .077     .6        5     .9    29    13.5
3 60 PCT T       89    .030   11.14     12   11.179    16420      13      89       6    .147    1.9       13     .9    59     8.3
4 30 PCT T       90    .020   10.93     13   10.959    12111      10      45       5    .077     .8        3     .4    29    13.5
5 10 PCT T       55    .030   10.74     10   10.776     8891       6      50       3    .057     .3        3     .2    10    16.9
6 30 PCT T       55    .050   11.10     23   11.156    12111       6     110       8    .077     .5        8     .6    29    13.5
7 90 PCT T       76    .010   11.48     22   11.498    22000      15      39      14    .113    1.7        4    1.6    88     2.8
8 30 PCT T       24    .040   11.04     24   11.082    12111       3      88      11    .077     .2        7     .8    29    13.5
9 C.T.           17    .030    7.75      2    7.782     3720       1      29       0    .143     .1        4     .0     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .2        2     .2
1 IDLE           69    .050   10.34      8   10.392     3402       2      33       1    .232     .5        8     .2     0    14.2
2 30 PCT T       86    .030   11.13     35   11.169    12111       9      66      13    .077     .7        5    1.0    29    13.5
3 60 PCT T       69    .030   11.25     16   11.289    16420      13      88       8    .147    1.9       13    1.1    59     8.3
4 30 PCT T       83    .030   10.93     18   10.968    12111       9      67       7    .077     .7        5     .5    29    13.5
5 10 PCT T       52    .030   11.22      9   11.255     8891       4      48       2    .057     .2        3     .1    10    16.9
6 30 PCT T       55    .070   11.56     25   11.636    12111       6     147       9    .077     .4       11     .7    29    13.5
7 90 PCT T       77    .010   12.18     23   12.198    22000      14      36      19    .113    1.6        4    1.6    88     2.8
8 30 PCT T       21    .030    9.45     28    9.482    12111       3      77      12    .077     .2        6     .9    29    13.5
9 C.T.           19    .030    7.75      1    7.781     3720       1      29       0    .143     .1        4     .0     0    22.3
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   .2        2     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------   .3        2     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------   .2        2     .2
FOUR CYCLE COMPOSITE -                HC- FID  0.35(      .3) + 0.65(      .2) =    .260   GM/BHP HR
                                      CO- NDIR 0.35(     2.2) + 0.65(     2.0) =   2.106   GM/BHP HR
                                      NO2-CL   0.35(      .3) + 0.65(      .2) =    .260   GM/BHP HR
                                                            CORRECTED NO2 =    .278   GM/BHP HR
                                                                     BSFC =    .814   LB/BHP HR
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                        TABLE F-56 MASS EMISSIONS BY NINE-MODE EPA
ENGINE 6-1P  TEST 68 RUN 3    R+D CAT-AIR-64          08-15-73       K =1.064      HUM = 99.0  GR/LB
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MODE           CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT. .     WEIGHTED GM/HR              MAN.
               HC     CO     CO2     NO      CARBON   CONS.      HC      CO     NO2     FACT.    HC       CO    NO2     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         26    .050   10.39    41     10.468    3402
2 30 PCT T     10    .040   11.94    78     11.991   12111        9      33      4     .232     2.1       8    1.0      0   19.2
3 60 PCT T     10    .050   12.07    61     12.131   16420       11      82     26     .077      .8       6    2.0     29   13.5
4 30 PCT T     13    .050   11.71    52     11.774   12111       15     137     27     .147     2.1      20    4.0     59    8.3
5 10 PCT T     12    .040   11.04    43     11.093    8891       14     104     18     .077     1.1       8    1.4     29   13.5
6 30 PCT T     13    .050   11.61    62     11.674   12111       10      65     11     .057      .6       4     .7     10   16.9
7 90 PCT T     17    .050   12.40    61     12.468   22000       15     105     21     .077     1.1       8    1.6     29   13.5
8 30 PCT T     14    .070   11.23    50     11.315   12111       32     178     36     .113     3.7      20    4.0     88    2.8
9 C.T.         13    .040    7.68    24      7.734    3720       16     151     18     .077     1.2      12    1.4     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  7      39      4     .143     1.0       6     .5      0   22.3
1 IDLE         26    .050   10.39    41     10.468    3402                                        .5       3     .6
2 30 PCT T     16    .050   11.23    60     11.297   12111        9      33      4     .232     2.1       8    1.0      0   19.2
3 60 PCT T     18    .040   11.45    37     11.509   16420       19     108     21     .077     1.4       8    1.6     29   13.5
4 30 PCT T     15    .050   11.19    39     11.256   12111       28     115     18     .147     4.1      17    2.6     59    8.3
5 10 PCT T     13    .050   10.69    32     10.754    8891       17     109     14     .077     1.3       8    1.1     29   13.5
6 30 PCT T     12    .040   11.14    54     11.193   12111       12      84      9     .057      .7       5     .5     10   16.9
7 90 PCT T     20    .060   12.02    48     12.102   22000       14      87     19     .077     1.1       7    1.5     29   13.5
8 30 PCT T     19    .040   11.11    59     11.171   12111       39     220     29     .113     4.4      25    3.3     88    2.8
9 C.T.         17    .040    7.68    20      7.738    3720       22      88     21     .077     1.7       7    1.6     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  9      39      3     .143     1.3       6     .5      0   22.3
1 IDLE         26    .050   10.16    25     10.238    3402                                        .6       3     .5
2 30 PCT T     21    .050   11.21    48     11.283   12111        9      34      3     .232     2.2       8     .6      0   19.2
3 60 PCT T     22    .050   11.21    30     11.284   16420       24     108     17     .077     1.9       8    1.3     29   13.5
4 30 PCT T     20    .050   11.10    36     11.172   12111       35     147     14     .147     5.1      22    2.1     59    8.3
5 10 PCT T     23    .040   10.59    32     10.655    8891       23     109     13     .077     1.8       8    1.0     29   13.5
6 30 PCT T     18    .030   11.31    50     11.359   12111       21      67      9     .057     1.2       4     .5     10   16.9
7 90 PCT T     17    .050   11.76    46     11.828   22000       21      65     18     .077     1.6       5    1.4     29   13.5
8 30 PCT T     13    .060   11.16    42     11.234   12111       34     188     28     .113     3.9      21    3.2     88    2.8
9 C.T.         16    .040    7.50    20      7.557    3720       15     131     15     .077     1.2      10    1.2     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  9      40      3     .143     1.2       6     .5      0   22.3
1 IDLE         26    .050   10.16    25     10.238    3402                                        .7       3     .4
2 30 PCT T     26    .060   11.39    55     11.478   12111        9      34      3     .232     2.2       8     .6      0   19.2
3 60 PCT T     27    .040   11.39    32     11.459   16420       30     128     19     .077     2.3      10    1.5     29   13.5
4 30 PCT T     21    .050   11.04    38     11.113   12111       42     116     15     .147     6.1      17    2.2     59    8.3
5 10 PCT T     15    .050   10.89    31     10.956    8891       25     110     14     .077     1.9       8    1.1     29   13.5
6 30 PCT T     18    .030   11.33    55     11.379   12111       13      82      8     .057      .7       5     .5     10   16.9
7 90 PCT T     23    .060   12.11    46     12.195   22000       21      64     19     .077     1.6       5    1.5     29   13.5
8 30 PCT T     20    .060   10.36    46     10.442   12111       45     219     28     .113     5.1      25    3.1     88    2.8
9 C.T.         21    .040    7.50    22      7.563    3720       25     141     18     .077     1.9      11    1.4     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------- 11      40      4     .143     1.6       6     .5      0   22.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------         .8       3     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------         .6       3     .5
FOUR CYCLE COMPOSITE -                                                                         .8       3     .4
                                    HC- NDIR 0.35(    .6) + 0.65(    .8) =     .695   GM/BHP HR
                                    CO- NDIR 0.35(   3.2) + 0.65(   3.3) =    3.252   GM/BHP HR
                                    NO2-NDIR 0.35(    .5) + 0.65(    .4) =     .465   GM/BHP HR
                                                         CORRECTED NO2 =     .495   GM/BHP HR
                                                                  BSFC =     .814   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR               MAN.
              HC-FID    CO     CO2   NO-CL   CARBON LCONS?       HC      CO     NO2     FACT.  HC-FID     CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         216    .050   10.39    18    10.462    3402
2 30 PCT T     160    .040   11.94    50    11.996   12111        7      33      2     .232     1.6       8     .5      0   19.2
3 60 PCT T     111    .050   12.07    56    12.131   16420       16      82     17     .077     1.2       6    1.3     29   13.5
4 30 PCT T     129    .050   11.71    25    11.773   12111       15     137     25     .147     2.2      20    3.7     59    8.3
5 10 PCT T      97    .040   11.04    13    11.090    8891       13     104      9     .077     1.0       8     .7     29   13.5
6 30 PCT T      92    .050   11.61    34    11.670   12111        8      65      3     .057      .4       4     .2     10   16.9
7 90 PCT T      98    .050   12.40    30    12.460   22000       10     105     12     .077      .8       8     .9     29   13.5
8 30 PCT T      31    .070   11.23    25    11.303   12111       17     178     18     .113     2.0      20    2.0     88    2.8
9 C.T.          14    .040    7.68     3     7.721    3720        3     152      9     .077      .3      12     .7     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  1      39      0     .143      .1       6     .1      0   22.3
1 IDLE   [illegible]  .050   10.39    18    10.462    3402                                        .3       3     .4
2 30 PCT T [illegible] .050  11.23    38    11.289   12111        7      33      2     .232     1.6       8     .5      0   19.2
3 60 PCT T      90    .040   11.45    15    11.499   16420       10     108     14     .077      .8       8    1.0     29   13.5
4 30 PCT T [illegible] .050  11.19    17    11.249   12111       13     115      7     .147     1.9      17    1.0     59    8.3
5 10 PCT T      52    .050   10.69    12    10.745    8891        9     109      6     .077      .7       8     .5     29   13.5
6 30 PCT T      52    .040   11.14    31    11.185   12111        4      84      3     .057      .2       5     .2     10   16.9
7 90 PCT T      77    .060   12.02    24    12.088   22000        6      87     11     .077      .4       7     .9     29   13.5
8 30 PCT T      24    .040   11.11    27    11.152   12111       14     221     15     .113     1.6      25    1.6     88    2.8
9 C.T.          14    .040    7.68     2     7.721    3720        3      88     10     .077      .2       7     .7     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  1      39      0     .143      .1       6     .0      0   22.3
1 IDLE         140    .050   10.16     5    10.224    3402                                        .3       3     .2
2 30 PCT T      93    .050   11.21    25    11.269   12111        5      34      1     .232     1.1       8     .1      0   19.2
3 60 PCT T      89    .050   11.21    12    11.269   16420       10     109      9     .077      .8       8     .7     29   13.5
4 30 PCT T      93    .050   11.10    16    11.159   12111       13     147      6     .147     1.9      22     .9     59    8.3
5 10 PCT T      48    .040   10.59     9    10.635    8891       10     110      6     .077      .8       8     .4     29   13.5
6 30 PCT T      44    .030   11.31    26    11.345   12111        4      68      2     .057      .2       4     .1     10   16.9
7 90 PCT T      80    .050   11.76    21    11.818   22000        5      65      9     .077      .4       5     .7     29   13.5
8 30 PCT T      24    .060   11.16    20    11.222   12111       15     188     13     .113     1.7      21    1.5     88    2.8
9 C.T.          11    .040    7.50     3     7.541    3720        3     131      7     .077      .2      10     .6     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  1      40      0     .143      .1       6     .1      0   22.3
1 IDLE         140    .050   10.16     5    10.224    3402                                        .3       3     .2
2 30 PCT T      93    .060   11.39    30    11.459   12111        5      34      1     .232     1.1       8     .1      0   19.2
3 60 PCT T [illegible] .040  11.39     9    11.438   16420       10     128     11     .077      .8      10     .8     29   13.5
4 30 PCT T [illegible] .050  11.04    15    11.099   12111       12     116      4     .147     1.8      17     .6     59    8.3
5 10 PCT T      55    .050   10.89     9    10.946    8891       10     110      5     .077      .8       8     .4     29   13.5
6 30 PCT T      44    .030   11.33    22    11.365   12111        4      82      2     .057      .3       5     .1     10   16.9
7 90 PCT T      77    .060   12.11    21    12.178   22000        5      65      8     .077      .4       5     .6     29   13.5
8 30 PCT T      21    .060   10.36    22    10.422   12111       14     219     13     .113     1.6      25    1.5     88    2.8
9 C.T.          14    .040    7.50     3     7.541    3720        2     141      8     .077      .2      11     .7     29   13.5
---------------CYCLE COMPOSITE IN GM/BHP HR----------------------  1      40      0     .143      .1       6     .1      0   22.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------         .2       3     .2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------         .3       3     .3
FOUR CYCLE COMPOSITE -                                                                         .2       3     .2
                                    HC- FID  0.35(    .3) + 0.65(    .2) =     .266   GM/BHP HR
                                    CO- NDIR 0.35(   3.2) + 0.65(   3.3) =    3.256   GM/BHP HR
                                    NO2-CL   0.35(    .3) + 0.65(    .2) =     .215   GM/BHP HR
                                                         CORRECTED NO2 =     .229   GM/BHP HR
                                                                  BSFC =     .814   LB/BHP HR
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TABLE F-57 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-00 TEST-53 RUN-1 1973 STANDARD ENGINE 07-17-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	16.5	7.1	16.5	0	967	.410	13.05	65
2	1200	7.0	2	18.0	10.3	15.3	0	299	.410	14.23	105
3	1200	25.0	6	17.5	11.3	14.2	0	1544	1.900	13.62	105
4	1200	57.0	13	15.8	13.9	14.0	0	1900	2.130	13.48	170
5	1200	79.0	18	14.3	15.9	14.2	0	1781	1.680	13.62	300
6	1200	158.0	36	9.5	22.7	14.4	0	2144	1.380	13.33	970
7	1200	236.0	54	5.4	31.7	13.5	0	2746	3.230	12.36	962
8	1200	261.0	60	4.0	34.7	13.8	0	2765	2.530	12.62	1525
9	1200	297.0	68	1.8	36.5	14.2	0	2698	2.090	12.62	2300
10	1200	316.0	72	.4	41.0	12.9	0	3845	4.420	11.57	850
11	750	0.0	0	16.9	7.1	14.7	0	1189	1.160	13.19	65
12	1200	0.0	0	20.3	7.6	15.1	0	6841	.720	10.46	40
13	2300	299.0	131	1.0	74.0	12.3	0	2415	5.760	11.21	912
14	2300	274.0	120	2.3	59.8	14.3	0	727	1.290	13.77	2000
15	2300	246.0	108	4.4	55.8	14.2	0	1019	1.520	13.61	2012
16	2300	225.0	99	6.0	52.1	13.9	0	1528	1.980	13.47	1712
17	2300	150.0	66	11.0	39.7	14.2	0	1551	1.250	13.77	1462
18	2300	75.0	33	15.5	27.8	14.0	0	1327	1.750	13.62	565
19	2300	54.0	24	16.8	25.0	14.1	0	1284	1.550	13.77	415
20	2300	24.0	11	18.5	20.8	14.1	0	949	1.430	13.91	230
21	2300	7.0	3	19.3	18.8	14.2	0	700	1.240	14.07	170
22	750	0.0	0	16.4	7.1	14.9	0	1446	.870	13.62	60
23	2300	0.0	0	23.9	7.2	16.8	0	21019	.690	10.80	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	23.0	197	5.1	.070	0.0	I	R	H	R
2	0.0	9.5	264	11.1	.060	.1	0.0	5.95	164.9	6.9
3	0.0	50.5	1255	11.4	.060	.3	0.0	8.84	219.7	2.0
4	0.0	75.8	1717	22.5	.050	.7	0.0	5.82	131.8	1.7
5	0.0	83.0	1581	46.4	.030	.5	0.0	4.60	87.6	2.6
6	0.0	147.9	1923	222.2	.060	2.2	0.0	4.10	53.3	6.2
7	0.0	248.9	5914	289.5	0.000	0.0	0.0	4.62	109.7	5.4
8	0.0	282.1	5214	516.6	.040	2.4	0.0	4.73	87.4	8.7
9	0.0	298.2	4666	844.0	0.000	0.0	0.0	4.39	68.8	12.4
10	0.0	436.8	10141	320.5	0.000	0.0	0.0	6.05	140.4	4.4
11	0.0	26.5	522	4.8	.070	0.0	I	R	R	R
12	0.0	198.8	423	3.9	.120	0.0	I	R	R	R
13	0.0	470.9	22691	590.5	.025	3.3	0.0	3.60	173.3	4.5
14	0.0	130.3	4671	1190.2	.055	6.6	0.0	1.09	38.9	9.9
15	0.0	169.3	5102	1110.0	.035	3.8	0.0	1.57	47.4	10.3
16	0.0	231.4	6058	860.9	.060	5.9	0.0	2.35	61.5	8.7
17	0.0	184.1	2996	576.0	.060	3.9	0.0	2.30	45.6	8.8
18	0.0	108.0	2875	152.6	0.000	0.0	0.0	3.29	87.5	4.6
19	0.0	94.3	2298	101.1	.065	1.5	0.0	3.99	97.2	4.3
20	0.0	58.0	1766	46.7	0.000	0.0	0.0	5.52	168.0	4.4
21	0.0	38.8	1389	31.3	0.000	0.0	0.0	12.66	453.1	10.2
22	0.0	31.8	387	4.4	.080	0.0	I	R	R	R
23	0.0	505.1	335	1.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	4.681	GRAM/BHP HR
	CO	76.747	GRAM/BHP HR
	NO2	8.050	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.716	LB/BHP HR

TABLE F-58 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-00 TEST-53 RUN-2 1973 STANDARD ENGINE 07-17-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	16.5	7.2	15.5	0	875	1.090	12.86	65
2	1200	7.0	2	18.3	9.9	15.1	0	468	.670	14.03	95
3	1200	26.0	6	17.2	11.0	14.4	0	1425	1.590	13.58	115
4	1200	58.0	13	15.7	13.9	14.2	0	1882	1.940	13.29	180
5	1200	87.0	20	13.8	16.5	14.3	0	1824	1.570	13.58	350
6	1200	161.0	37	9.6	23.4	14.1	0	2396	1.940	13.29	830
7	1200	242.0	55	5.2	31.7	13.2	0	3196	3.770	11.53	550
8	1200	264.0	60	4.1	34.8	13.4	0	3235	2.950	11.66	1382
9	1200	298.0	68	1.1	36.5	14.3	0	2884	1.960	12.18	2100
10	1200	323.0	74	.4	41.4	12.8	0	4229	4.690	11.79	775
11	750	0.0	0	16.9	7.5	15.4	0	961	.990	13.14	65
12	1200	0.0	0	20.3	7.4	15.0	0	6738	.850	12.45	45
13	2300	303.0	133	1.0	74.2	12.5	0	2082	5.510	11.41	1025
14	2300	280.0	123	2.3	61.0	14.0	0	942	1.980	13.29	1875
15	2300	248.0	109	4.3	55.7	14.3	0	783	1.360	13.58	2050
16	2300	227.0	99	5.9	52.5	14.1	0	1141	1.790	13.43	1825
17	2300	152.0	67	10.7	39.3	14.3	0	1365	1.110	13.73	1475
18	2300	76.0	33	15.2	28.0	14.0	0	1543	1.860	13.58	520
19	2300	55.0	24	16.9	25.3	13.9	0	1343	1.900	13.58	390
20	2300	24.0	11	18.6	20.6	13.9	0	1144	1.940	13.58	205
21	2300	7.0	3	19.5	19.2	13.9	0	893	1.940	13.58	150
22	750	0.0	0	16.7	7.1	14.6	0	1985	1.540	13.00	60
23	2300	0.0	0	23.9	7.3	16.7	0	22113	.740	10.68	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	20.4	512	5.0	.070	0.0	I	R	R	R
2	0.0	14.3	412	9.6	.060	.1	0.0	8.91	257.7	6.0
3	0.0	46.4	1047	12.4	.060	.4	0.0	7.82	176.2	2.1
4	0.0	77.0	1603	24.4	.050	.7	0.0	5.81	120.9	1.8
5	0.0	89.0	1548	56.7	.030	.6	0.0	4.48	77.9	2.9
6	0.0	164.4	2689	189.1	.060	2.2	0.0	4.47	73.1	5.1
7	0.0	294.2	7011	168.1	0.000	0.0	0.0	5.32	126.8	3.0
8	0.0	342.0	6299	485.0	.040	2.4	0.0	5.67	104.4	8.0
9	0.0	330.9	4543	800.0	0.000	0.0	0.0	4.86	66.7	11.7
10	0.0	469.9	10525	285.9	0.000	0.0	0.0	6.37	142.6	3.9
11	0.0	23.0	478	5.2	.070	0.0	I	R	R	R
12	0.0	161.9	412	3.6	.120	0.0	I	R	R	R
13	0.0	409.1	21871	668.7	.025	3.3	0.0	3.08	164.8	5.0
14	0.0	169.6	7203	1121.1	.055	6.7	0.0	1.38	58.7	9.1
15	0.0	131.7	4622	1145.0	.035	3.8	0.0	1.21	42.6	10.5
16	0.0	177.2	5615	941.0	.060	6.0	0.0	1.78	56.5	9.5
17	0.0	162.4	2669	582.9	.060	4.0	0.0	2.44	40.1	8.8
18	0.0	125.7	3060	140.6	0.000	0.0	0.0	3.78	91.9	4.2
19	0.0	98.7	2821	95.2	.065	1.6	0.0	4.10	117.1	4.0
20	0.0	68.3	2342	40.7	0.000	0.0	0.0	6.50	222.8	3.9
21	0.0	49.8	2186	27.8	0.000	0.0	0.0	16.26	713.3	9.1
22	0.0	43.4	680	4.4	.080	0.0	I	R	R	R
23	0.0	537.2	363	1.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	4.503	GRAM/BHP HR
	CO	82.208	GRAM/BHP HR
	NO2	7.965	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.709	LB/BHP HR

TABLE F-59 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 6-00 TEST-53 RUN-3 1973 STANDARD ENGINE 07-17-73

								DRY CONCENTRATION			
MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	HC	CO	CO2	NO
1	750	0.0	0	16.4	6.9	15.1	0	1420	.950	13.73	60
2	1200	7.0	2	18.0	10.4	15.1	0	441	.500	14.33	90
3	1200	25.0	6	17.5	11.6	14.4	0	1426	1.470	13.73	120
4	1200	56.0	13	15.7	13.9	14.1	0	1942	1.940	13.43	185
5	1200	79.0	18	14.3	16.8	14.2	0	1920	1.560	13.29	315
6	1200	158.0	36	9.6	22.6	14.5	0	2040	1.130	13.29	1038
7	1200	236.0	54	5.5	31.6	13.0	0	3099	4.310	11.66	713
8	1200	259.0	59	4.1	34.3	13.4	0	2860	3.370	12.18	1238
9	1200	289.0	66	2.0	35.8	14.2	0	3010	1.830	12.86	1950
10	1200	316.0	72	.4	40.9	13.1	0	3658	4.050	11.41	813
11	750	0.0	0	16.5	6.8	14.7	0	1862	1.170	12.72	70
12	1200	0.0	0	20.3	7.5	15.0	0	6191	.860	12.72	50
13	2300	303.0	133	1.0	74.6	12.4	0	2026	5.760	11.28	963
14	2300	278.0	122	2.2	59.8	14.3	0	555	1.260	13.58	1963
15	2300	248.0	109	4.3	55.6	14.3	0	768	1.360	13.58	2038
16	2300	226.0	99	6.0	52.5	14.0	0	1256	1.900	13.43	1775
17	2300	151.0	66	10.9	38.8	14.3	0	1452	1.170	13.88	1425
18	2300	75.0	33	15.6	27.8	14.0	0	1430	1.680	13.88	560
19	2300	54.0	24	16.9	25.2	14.0	0	1301	1.610	13.88	400
20	2300	24.0	11	18.5	20.4	14.1	0	971	1.560	13.88	220
21	2300	7.0	3	19.5	18.6	14.1	0	672	1.380	14.03	150
22	750	0.0	0	16.5	6.7	14.9	0	1816	.850	13.73	60
23	2300	0.0	0	23.8	7.3	16.7	0	22090	.620	10.68	10

	CALCULATED GRAM/HR						BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	ALDE.	HC	CO	NO2
1	0.0	30.0	405	4.2	.070	0.0	I	R	R	R
2	0.0	14.0	320	9.5	.060	.1	0.0	8.75	200.3	5.9
3	0.0	48.9	1018	13.7	.060	.3	0.0	8.56	178.3	2.4
4	0.0	78.7	1588	24.9	.050	.6	0.0	6.15	124.1	1.9
5	0.0	97.3	1596	53.0	.030	.5	0.0	5.39	88.4	2.9
6	0.0	143.0	1600	241.6	.060	2.2	0.0	3.96	44.3	6.7
7	0.0	272.8	7665	208.4	0.000	0.0	0.0	5.06	142.2	3.9
8	0.0	280.9	6688	403.8	.040	2.4	0.0	4.75	113.0	6.8
9	0.0	326.1	4004	701.3	0.000	0.0	0.0	4.94	60.6	10.6
10	0.0	428.8	9590	316.4	0.000	0.0	0.0	5.94	132.8	4.4
11	0.0	40.8	518	5.1	.070	0.0	I	R	R	R
12	0.0	148.3	416	4.0	.120	0.0	I	R	R	R
13	0.0	397.6	22834	627.4	.025	3.3	0.0	3.00	172.1	4.7
14	0.0	101.1	4635	1186.8	.055	6.7	0.0	.83	38.1	9.7
15	0.0	129.0	4614	1136.3	.035	3.8	0.0	1.19	42.5	10.5
16	0.0	193.5	5914	908.0	.060	5.9	0.0	1.96	59.8	9.2
17	0.0	168.2	2737	548.0	.060	4.0	0.0	2.54	41.4	8.3
18	0.0	114.8	2725	149.3	0.000	0.0	0.0	3.50	83.0	4.5
19	0.0	95.2	2380	97.2	.065	1.5	0.0	4.03	100.6	4.1
20	0.0	57.9	1877	43.5	0.000	0.0	0.0	5.50	178.6	4.1
21	0.0	36.6	1520	27.1	0.000	0.0	0.0	11.95	495.7	8.9
22	0.0	37.4	353	4.1	.080	0.0	I	R	R	R
23	0.0	541.5	307	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE
HC 4.348 GRAM/BHP HR
CO 76.197 GRAM/BHP HR
NO2 7.984 GRAM/BHP HR
ALDE 0.000 GRAM/BHP HR
BSFC .710 LB/BHP HR

TABLE F-60 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-OP TEST 78 RUN-1 PARAMETRIC BASELINE 08-22-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.5	7.8	13.8	0	3533	3.560	11.53	45
2	1200	7.0	2	16.9	11.2	14.6	0	669	.950	13.88	90
3	1200	24.0	5	15.7	12.0	14.6	0	596	.820	13.88	115
4	1200	54.0	12	13.7	15.0	15.1	0	261	.320	13.88	230
5	1200	75.0	17	12.6	15.9	15.1	0	290	.310	13.88	330
6	1200	148.0	34	7.7	21.7	15.7	0	232	.150	13.43	1100
7	1200	223.0	51	4.8	29.3	14.0	0	2051	1.940	13.14	1425
8	1200	243.0	56	3.9	30.9	14.0	0	2134	1.790	13.14	1825
9	1200	272.0	62	1.6	33.4	14.4	0	1985	1.680	12.86	2200
10	1200	297.0	68	.3	40.8	12.8	0	4135	4.920	11.16	1350
11	600	0.0	0	15.5	7.5	12.8	0	4137	4.860	11.28	50
12	1200	0.0	0	20.2	7.9	13.6	0	23386	3.560	9.88	30
13	2300	285.0	125	1.0	71.0	12.7	0	1905	4.920	11.79	1625
14	2300	259.0	113	2.3	55.6	14.6	0	369	.770	14.03	2375
15	2300	234.0	102	4.4	52.6	14.2	0	927	1.310	13.88	2325
16	2300	214.0	94	6.0	50.7	14.0	0	1242	1.680	13.58	1875
17	2300	143.0	63	9.7	36.0	15.4	0	75	.120	13.88	1675
18	2300	71.0	31	14.8	26.3	14.8	0	256	.380	14.33	660
19	2300	51.0	22	16.0	24.5	14.9	0	245	.380	14.33	460
20	2300	22.0	10	17.7	20.7	14.9	0	181	.380	14.33	265
21	2300	5.0	2	18.5	18.3	14.9	0	117	.320	14.49	170
22	600	0.0	0	15.5	7.4	13.3	0	5613	4.210	11.53	45
23	2300	0.0	0	23.7	8.0	14.9	0	35229	2.090	8.82	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	80.9	1648	3.4	.070	0.0	I	R	R	R
2	0.0	22.8	654	10.2	.060	.1	0.0	14.26	409.2	6.4
3	0.0	22.0	611	14.1	.060	.3	0.0	4.01	111.4	2.6
4	0.0	12.5	309	36.5	.050	.6	0.0	1.01	25.1	3.0
5	0.0	14.7	318	55.6	.030	.5	0.0	.86	18.5	3.2
6	0.0	16.8	219	264.3	.060	2.0	0.0	.50	6.5	7.8
7	0.0	178.3	3407	411.4	0.000	0.0	0.0	3.50	66.9	8.1
8	0.0	197.5	3347	560.8	.040	2.2	0.0	3.56	60.3	10.1
9	0.0	204.1	3488	750.8	0.000	0.0	0.0	3.28	56.1	12.1
10	0.0	464.0	11152	502.9	0.000	0.0	0.0	6.84	164.3	7.4
11	0.0	85.0	2018	3.4	.070	0.0	I	R	R	R
12	0.0	531.1	1633	2.3	.120	0.0	I	R	R	R
13	0.0	363.0	18939	1028.1	.025	3.1	0.0	2.91	151.7	8.2
14	0.0	62.8	2644	1340.3	.055	6.2	0.0	.55	23.3	11.8
15	0.0	144.8	4131	1205.1	.035	3.6	0.0	1.41	40.3	11.8
16	0.0	185.6	5073	930.6	.060	5.6	0.0	1.98	54.1	9.9
17	0.0	8.7	283	648.3	.060	3.6	0.0	.14	4.5	10.4
18	0.0	20.7	621	177.4	0.000	0.0	0.0	.67	20.0	5.7
19	0.0	18.5	579	115.2	.065	1.5	0.0	.83	25.9	5.2
20	0.0	11.5	489	56.1	0.000	0.0	0.0	1.20	50.8	5.8
21	0.0	6.6	362	31.6	0.000	0.0	0.0	3.00	165.3	14.4
22	0.0	115.6	1751	3.1	.080	0.0	I	R	R	R
23	0.0	885.8	1061	1.3	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.114	GRAM/BHP HR
	CO	68.508	GRAM/BHP HR
	NO2	9.739	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.734	LB/BHP HR

TABLE F-61 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-OP TEST 78 RUN-2 PARAMETRIC BASELINE 08-22-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.5	8.0	14.0	0	4268	3.280	11.66	45
2	1200	7.0	2	17.0	11.5	14.4	0	585	1.330	13.43	80
3	1200	24.0	5	15.8	12.1	14.5	0	676	.930	14.03	120
4	1200	54.0	12	13.8	14.4	14.9	0	411	.410	14.03	225
5	1200	75.0	17	12.6	15.5	15.0	0	432	.360	14.03	335
6	1200	148.0	34	7.7	21.3	15.5	0	317	.160	13.73	1162
7	1200	223.0	51	4.8	29.5	13.9	0	2025	2.090	13.14	1375
8	1200	243.0	56	3.9	31.2	13.9	0	2265	1.860	13.29	1750
9	1200	272.0	62	1.6	33.5	14.4	0	2072	1.640	13.00	2325
10	1200	297.0	68	.3	41.0	12.6	0	4320	5.150	11.28	1375
11	600	0.0	0	15.5	7.6	12.9	0	3857	4.690	11.66	40
12	1200	0.0	0	20.2	7.8	13.6	0	22963	3.370	10.21	35
13	2300	285.0	125	1.0	71.0	12.6	0	2026	5.270	11.79	1563
14	2300	259.0	113	2.3	55.4	14.5	0	505	.930	14.03	2500
15	2300	234.0	102	4.4	52.2	14.2	0	970	1.360	13.88	2325
16	2300	214.0	94	5.9	51.0	14.0	0	1257	1.680	13.73	2075
17	2300	143.0	63	9.7	36.7	15.2	0	100	.150	14.03	1775
18	2300	71.0	31	14.8	26.2	14.7	0	294	.410	14.33	660
19	2300	51.0	22	16.0	24.5	14.7	0	238	.400	14.49	500
20	2300	22.0	10	17.6	20.5	14.8	0	146	.330	14.49	260
21	2300	5.0	2	18.4	18.4	14.8	0	100	.320	14.65	170
22	600	0.0	0	15.4	7.3	13.2	0	6985	4.160	11.53	45
23	2300	0.0	0	23.7	8.0	14.1	0	41736	2.410	8.22	20

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	100.8	1565	3.5	.070	0.0	I	R	R	R
2	0.0	20.6	546	9.3	.060	.1	0.0	12.88	591.3	5.8
3	0.0	24.7	686	14.6	.060	.3	0.0	4.50	125.1	2.7
4	0.0	18.6	374	33.7	.050	.6	0.0	1.50	30.3	2.7
5	0.0	21.0	354	54.2	.030	.5	0.0	1.23	20.7	3.2
6	0.0	22.0	224	267.7	.060	2.0	0.0	.65	6.6	7.9
7	0.0	175.6	3661	395.8	0.000	0.0	0.0	3.45	71.8	7.8
8	0.0	208.5	3458	534.7	.040	2.2	0.0	3.76	62.3	9.6
9	0.0	212.1	3391	790.0	0.000	0.0	0.0	3.41	54.6	12.7
10	0.0	476.5	11474	503.5	0.000	0.0	0.0	7.02	169.1	7.4
11	0.0	79.4	1951	2.7	.070	0.0	I	R	R	R
12	0.0	511.7	1517	2.6	.120	0.0	I	R	R	R
13	0.0	378.0	19860	968.1	.025	3.1	0.0	3.03	159.1	7.8
14	0.0	84.6	3145	1389.5	.055	6.2	0.0	.75	27.7	12.3
15	0.0	149.7	4241	1191.7	.035	3.6	0.0	1.46	41.4	11.6
16	0.0	187.1	5053	1025.8	.060	5.6	0.0	2.00	53.9	10.9
17	0.0	11.7	355	691.3	.060	3.8	0.0	.19	5.7	11.0
18	0.0	23.7	666	176.3	0.000	0.0	0.0	.76	21.4	5.7
19	0.0	17.7	602	123.7	.065	1.5	0.0	.79	27.0	5.5
20	0.0	9.1	418	54.1	0.000	0.0	0.0	.95	43.4	5.6
21	0.0	5.6	360	31.4	0.000	0.0	0.0	2.55	164.5	14.4
22	0.0	141.1	1698	3.0	.080	0.0	I	R	R	R
23	0.0	1023.1	1193	1.6	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.526	GRAM/BHP HR
	CO	70.858	GRAM/BHP HR
	NO2	10.029	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.734	LB/BHP HR

TABLE F-62 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-OP TEST 78 RUN-3 PARAMETRIC BASELINE 08-22-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	600	0.0	0	15.7	7.8	13.8	0	5043	3.560	11.53	45
2	1200	7.0	2	16.8	11.3	14.9	0	610	.490	14.18	90
3	1200	24.0	5	15.8	12.2	14.8	0	527	.700	14.18	120
4	1200	54.0	12	13.7	14.9	15.4	0	198	.150	14.03	220
5	1200	75.0	17	12.7	15.4	15.3	0	275	.160	14.03	359
6	1200	148.0	34	7.6	21.9	15.8	0	331	.110	13.58	1063
7	1200	223.0	51	4.9	29.5	14.1	0	1939	1.900	13.29	1500
8	1200	243.0	56	4.0	30.9	14.2	0	2052	1.720	13.43	1800
9	1200	272.0	62	1.5	33.7	14.5	0	1590	1.680	13.00	2100
10	1200	297.0	68	.3	41.2	13.0	0	3705	4.690	11.41	1325
11	600	0.0	0	15.6	7.5	13.1	0	3617	4.370	11.66	55
12	1200	0.0	0	20.2	7.9	13.5	0	23898	3.660	10.10	30
13	2300	285.0	125	1.0	71.6	12.9	0	1876	4.920	11.79	1663
14	2300	259.0	113	2.3	55.9	14.8	0	337	.770	13.88	2250
15	2300	234.0	102	4.4	52.7	14.4	0	741	1.180	13.88	2188
16	2300	214.0	94	5.9	50.8	14.2	0	1175	1.540	13.58	1938
17	2300	143.0	63	9.6	36.8	15.6	0	58	.110	13.73	1613
18	2300	71.0	31	14.8	26.5	15.0	0	219	.380	14.18	620
19	2300	51.0	22	16.0	24.7	14.9	0	268	.430	14.18	450
20	2300	22.0	10	17.7	20.5	14.9	0	184	.410	14.18	245
21	2300	5.0	2	18.5	18.7	14.9	0	143	.450	14.88	170
22	600	0.0	0	15.5	7.2	13.4	0	5714	4.160	11.28	45
23	2300	0.0	0	23.7	8.1	14.5	0	39513	2.330	8.22	15

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	114.4	1632	3.4	.070	0.0	I	R	R	R
2	0.0	21.2	344	10.4	.060	.1	0.0	13.27	215.3	6.5
3	0.0	19.5	524	14.8	.060	.3	0.0	3.56	95.6	2.7
4	0.0	9.4	144	34.8	.050	.6	0.0	.76	11.7	2.8
5	0.0	13.5	159	58.6	.030	.5	0.0	.79	9.3	3.4
6	0.0	24.0	161	255.5	.060	2.0	0.0	.71	4.8	7.6
7	0.0	168.6	3338	433.2	0.000	0.0	0.0	3.31	65.5	8.5
8	0.0	187.3	3171	545.5	.040	2.2	0.0	3.37	57.1	9.8
9	0.0	163.8	3496	718.2	0.000	0.0	0.0	2.64	56.3	11.6
10	0.0	420.4	10749	499.1	0.000	0.0	0.0	6.20	158.4	7.4
11	0.0	75.1	1832	3.8	.070	0.0	I	R	R	R
12	0.0	530.3	1640	2.2	.120	0.0	I	R	R	R
13	0.0	360.6	19102	1061.2	.025	3.1	0.0	2.89	153.0	8.5
14	0.0	58.2	2686	1289.9	.055	6.2	0.0	.51	23.7	11.4
15	0.0	117.0	3765	1147.4	.035	3.6	0.0	1.14	36.7	11.2
16	0.0	177.7	4704	973.0	.060	5.6	0.0	1.90	50.2	10.4
17	0.0	6.9	268	645.6	.060	3.8	0.0	.11	4.3	10.3
18	0.0	18.1	633	169.7	0.000	0.0	0.0	.58	20.4	5.5
19	0.0	20.5	665	114.4	.065	1.5	0.0	.92	29.8	5.1
20	0.0	11.7	527	51.8	0.000	0.0	0.0	1.21	54.7	5.4
21	0.0	7.9	502	31.2	0.000	0.0	0.0	3.60	229.5	14.2
22	0.0	116.6	1714	3.0	.080	0.0	I	R	R	R
23	0.0	1001.1	1192	1.3	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.330	GRAM/BHP HR
	CO	65.820	GRAM/BHP HR
	NO2	9.648	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.738	LB/BHP HR

TABLE F-63 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-OP TEST-77 RUN-1 0 CAT-AIR-EGR 10 PCT. 08-21-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	14.9	7.2	21.4	0	31	.060	10.10	50
2	1200	5.0	1	16.6	10.3	20.4	0	10	.060	10.68	70
3	1200	22.0	5	15.2	12.3	20.2	0	7	.060	10.80	105
4	1200	48.0	11	13.4	13.9	19.5	0	7	.060	11.16	150
5	1200	68.0	16	12.2	17.2	19.2	0	7	.060	11.28	230
6	1200	135.0	31	6.1	23.6	17.0	0	7	.060	13.14	210
7	1200	203.0	46	3.4	27.0	16.4	0	7	.060	13.73	670
8	1200	223.0	51	2.6	28.8	16.5	0	9	.060	13.58	975
9	1200	249.0	57	1.6	30.4	16.5	0	10	.060	13.58	1500
10	1200	270.0	62	.3	37.7	14.5	0	253	2.170	13.29	800
11	750	0.0	0	14.7	6.8	19.9	0	19	.060	10.80	45
12	1200	0.0	0	19.6	7.4	22.2	0	70	.060	9.02	25
13	2300	272.0	119	1.0	72.7	12.9	0	850	4.690	11.92	920
14	2300	249.0	109	2.1	57.2	14.4	0	82	1.000	14.03	1287
15	2300	223.0	98	3.2	52.8	15.6	0	9	.030	14.18	1675
16	2300	204.0	89	4.3	49.5	15.5	0	9	.250	14.33	1175
17	2300	135.0	59	7.3	38.4	17.5	0	3	.060	12.86	800
18	2300	68.0	30	11.6	29.4	17.7	0	6	.010	12.72	270
19	2300	48.0	21	13.0	26.6	18.0	0	4	.010	12.59	185
20	2300	22.0	10	15.0	22.7	18.5	0	7	.010	12.18	135
21	2300	5.0	2	16.6	20.5	18.8	0	3	.010	11.92	120
22	750	0.0	0	14.2	7.1	19.8	0	18	.010	10.56	45
23	2300	0.0	0	23.5	7.0	28.4	0	73	.010	7.30	6

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	1.0	39	5.3	.070	0.0	I	R	R	R
2	0.0	.4	53	10.1	.060	.1	0.0	.38	46.1	8.8
3	0.0	.3	62	17.9	.060	.3	0.0	.07	12.4	3.6
4	0.0	.4	68	28.0	.050	.5	0.0	.03	6.2	2.6
5	0.0	.5	83	52.5	.030	.5	0.0	.03	5.4	3.4
6	0.0	.5	98	56.5	.060	1.9	0.0	.02	3.2	1.8
7	0.0	.6	108	197.5	0.000	0.0	0.0	.01	2.3	4.3
8	0.0	.9	116	310.0	.040	2.0	0.0	.02	2.3	6.1
9	0.0	1.0	123	503.4	0.000	0.0	0.0	.02	2.2	8.8
10	0.0	27.9	4841	293.3	0.000	0.0	0.0	.45	78.5	4.8
11	0.0	.5	34	4.2	.070	0.0	I	R	R	R
12	0.0	2.6	45	3.1	.120	0.0	I	R	R	R
13	0.0	167.9	18713	603.3	.025	3.0	0.0	1.41	157.1	5.1
14	0.0	14.1	3485	737.2	.055	6.0	0.0	.13	32.0	6.8
15	0.0	1.5	102	937.2	.035	3.4	0.0	.02	1.0	9.6
16	0.0	1.4	778	600.7	.060	5.4	0.0	.02	8.7	6.7
17	0.0	.5	163	358.1	.060	3.5	0.0	.01	2.8	6.1
18	0.0	.6	21	93.9	0.000	0.0	0.0	.02	.7	3.2
19	0.0	.4	19	58.8	.065	1.4	0.0	.02	.9	2.8
20	0.0	.6	17	37.9	0.000	0.0	0.0	.06	1.8	3.9
21	0.0	.3	16	31.1	0.000	0.0	0.0	.12	7.2	14.2
22	0.0	.5	6	4.6	.080	0.0	I	R	R	R
23	0.0	3.2	9	.9	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.213	GRAM/BHP HR
	CO	27.046	GRAM/BHP HR
	NO2	6.145	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.780	LB/BHP HR

TABLE F-64 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-OP TEST-77 RUN-2 0 CAT-AIR-EGR 10 PCT. 08-21-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	15.0	7.8	20.5	0	34	.010	10.44	30
2	1200	5.0	1	16.8	11.3	20.6	0	3	.010	10.21	55
3	1200	22.0	5	15.4	12.6	19.7	0	3	.010	10.80	84
4	1200	48.0	11	13.4	13.9	19.8	0	7	.010	10.68	150
5	1200	42.0	10	10.3	17.3	19.6	0	7	.010	10.44	150
6	1200	135.0	31	6.5	22.3	17.2	0	7	.010	12.31	265
7	1200	203.0	46	3.5	27.1	16.3	0	7	.010	13.14	675
8	1200	223.0	51	2.7	28.5	16.5	0	10	.010	12.72	1125
9	1200	249.0	57	1.7	30.3	16.7	0	12	.010	12.86	1662
10	1200	269.0	61	.3	39.2	14.2	0	217	1.980	13.14	712
11	750	0.0	0	15.0	7.5	20.0	0	13	.010	11.41	37
12	1200	0.0	0	19.6	7.6	22.4	0	74	.060	8.82	23
13	2300	274.0	120	1.0	71.2	13.5	0	700	3.190	12.31	1250
14	2300	249.0	109	2.2	55.8	15.3	0	62	1.190	13.00	2000
15	2300	223.0	98	3.9	52.0	15.8	0	9	.010	14.03	1737
16	2300	203.0	89	4.9	49.4	15.7	0	9	.030	14.03	1312
17	2300	135.0	59	7.4	37.7	17.3	0	3	.030	12.45	787
18	2300	68.0	30	11.7	28.6	17.4	0	6	.030	13.58	275
19	2300	48.0	21	13.2	26.0	17.9	0	7	.030	12.05	200
20	2300	22.0	10	15.1	22.6	18.3	0	7	.030	11.79	135
21	2300	5.0	2	16.8	19.7	18.6	0	7	.030	11.41	110
22	750	0.0	0	14.8	7.3	20.3	0	25	.010	10.44	40
23	2300	0.0	0	23.4	6.9	28.7	0	60	.030	7.12	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	1.2	7	3.4	.070	0.0	I	R	R	R
2	0.0	.2	10	9.2	.060	.1	0.0	.14	8.9	8.0
3	0.0	.2	11	14.7	.060	.3	0.0	.03	2.1	2.9
4	0.0	.4	12	29.4	.050	.5	0.0	.04	1.1	2.7
5	0.0	.5	15	37.4	.030	.3	0.0	.05	1.6	3.9
6	0.0	.5	17	72.2	.060	1.9	0.0	.02	.5	2.3
7	0.0	.6	19	209.5	0.000	0.0	0.0	.01	.4	4.5
8	0.0	1.0	21	379.3	.040	2.0	0.0	.02	.4	7.4
9	0.0	1.3	22	589.2	0.000	0.0	0.0	.02	.4	10.4
10	0.0	25.4	4697	277.6	0.000	0.0	0.0	.41	76.4	4.5
11	0.0	.4	6	3.7	.070	0.0	I	R	R	R
12	0.0	2.9	47	3.0	.120	0.0	I	R	R	R
13	0.0	145.1	13366	860.8	.025	3.0	0.0	1.21	111.4	7.2
14	0.0	11.1	4286	1183.9	.055	6.0	0.0	.10	39.3	10.9
15	0.0	1.5	34	968.8	.035	3.4	0.0	.02	.3	9.9
16	0.0	1.4	97	694.2	.060	5.3	0.0	.02	1.1	7.8
17	0.0	.5	83	358.0	.060	3.5	0.0	.01	1.4	6.1
18	0.0	.5	58	87.0	0.000	0.0	0.0	.02	1.9	2.9
19	0.0	.7	59	64.8	.065	1.4	0.0	.03	2.8	3.1
20	0.0	.6	53	38.9	0.000	0.0	0.0	.06	5.5	4.0
21	0.0	.5	47	28.5	0.000	0.0	0.0	.24	21.6	13.0
22	0.0	.8	6	4.2	.080	0.0	I	R	R	R
23	0.0	2.6	27	.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.189	GRAM/BHP HR
	CO	21.559	GRAM/BHP HR
	NO2	7.661	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.781	LB/BHP HR

TABLE F-65 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 6-1P TEST 67 RUN-1 R+O CAT-AIR-64 08-14-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	15.1	7.9	18.7	0	194	.010	11.60	15
2	1200	5.0	1	16.2	11.3	20.6	0	22	.010	10.44	51
3	1200	20.0	5	15.7	12.3	19.3	0	138	.010	11.28	4
4	1200	45.0	10	14.3	13.8	18.5	0	125	.020	11.79	7
5	1200	62.0	14	13.5	15.7	17.7	0	139	.020	12.31	18
6	1200	125.0	29	9.4	20.6	16.9	0	124	.010	13.00	31
7	1200	186.0	42	5.5	27.8	14.5	0	342	1.020	14.03	70
8	1200	205.0	47	4.5	29.5	14.6	0	295	.930	14.03	87
9	1200	230.0	53	2.8	30.5	14.9	0	95	.270	14.25	99
10	1200	249.0	57	.3	39.5	13.3	0	1168	4.000	14.18	94
11	750	0.0	0	15.5	8.2	18.2	0	16	.010	12.05	12
12	1200	0.0	0	19.4	7.6	21.2	0	349	.010	9.99	5
13	2300	259.0	113	1.0	71.9	12.5	0	1172	5.450	11.53	61
14	2300	238.0	104	2.6	56.5	14.7	0	15	.120	14.65	38
15	2300	211.0	92	4.7	54.7	14.4	0	136	.800	14.65	84
16	2300	194.0	85	5.9	52.0	14.3	0	207	1.100	14.33	42
17	2300	129.0	56	10.5	38.0	15.9	0	41	.020	13.73	23
18	2300	64.0	28	14.9	28.1	16.4	0	28	.020	13.43	40
19	2300	46.0	20	16.2	25.5	16.7	0	34	.020	13.14	39
20	2300	20.0	9	17.9	21.5	17.3	0	47	.010	12.59	25
21	2300	5.0	2	18.7	19.4	17.9	0	71	.010	12.18	17
22	750	0.0	0	15.0	7.5	18.4	0	59	.010	11.92	11
23	2300	0.0	0	23.3	8.0	29.1	0	232	.010	7.12	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	6.0	6	1.5	.070	0.0	I	R	R	R
2	0.0	1.1	10	8.3	.060	.1	0.0	.94	8.7	7.3
3	0.0	6.8	10	.7	.060	.3	0.0	1.49	2.2	.1
4	0.0	6.6	21	1.2	.050	.5	0.0	.65	2.1	.1
5	0.0	8.0	23	3.4	.030	.4	0.0	.57	1.6	.2
6	0.0	8.9	14	7.4	.060	1.7	0.0	.31	.5	.3
7	0.0	28.6	1722	19.4	0.000	0.0	0.0	.67	40.5	.5
8	0.0	26.3	1677	25.8	.040	1.9	0.0	.56	35.8	.6
9	0.0	9.1	519	31.3	0.000	0.0	0.0	.17	9.9	.6
10	0.0	114.4	7912	30.6	0.000	0.0	0.0	2.01	139.1	.5
11	0.0	.5	6	1.2	.070	0.0	I	R	R	R
12	0.0	12.0	7	.6	.120	0.0	I	R	R	R
13	0.0	223.6	21000	38.6	.025	2.8	0.0	1.97	185.1	.3
14	0.0	2.6	421	21.9	.055	5.7	0.0	.02	4.0	.2
15	0.0	21.8	2593	44.7	.035	3.2	0.0	.24	28.1	.5
16	0.0	31.6	3392	21.3	.060	5.1	0.0	.37	39.9	.3
17	0.0	5.1	51	9.6	.060	3.4	0.0	.09	.9	.2
18	0.0	2.7	38	12.6	0.000	0.0	0.0	.10	1.4	.4
19	0.0	3.0	35	11.4	.065	1.3	0.0	.15	1.8	.6
20	0.0	3.6	16	6.4	0.000	0.0	0.0	.41	1.8	.7
21	0.0	5.1	15	4.1	0.000	0.0	0.0	2.35	6.7	1.9
22	0.0	1.7	6	1.0	.080	0.0	I	R	R	R
23	0.0	11.8	10	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.538	GRAM/BHP HR
	CO	34.814	GRAM/BHP HR
	NO2	.336	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.831	LB/BHP HR

TABLE F-66 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 6-1P TEST-67 RUN-2 R+D CAT-AIR-64 08-14-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	15.4	8.0	19.6	0	193	.010	11.04	16
2	1200	5.0	1	16.5	10.9	19.5	0	24	.010	11.28	40
3	1200	20.0	5	15.8	12.1	18.0	0	145	.010	11.79	9
4	1200	45.0	10	14.2	13.7	17.1	0	129	.010	12.86	7
5	1200	62.0	14	13.4	15.4	17.0	0	135	.010	12.86	16
6	1200	125.0	29	9.2	20.6	16.4	0	119	.010	13.43	47
7	1200	186.0	42	5.4	27.5	14.4	0	414	1.150	14.03	50
8	1200	205.0	47	4.5	29.8	14.4	0	374	1.240	14.03	72
9	1200	230.0	53	2.7	31.1	14.8	0	107	.370	14.33	88
10	1200	249.0	57	.3	38.9	13.3	0	1154	4.160	14.03	64
11	750	0.0	0	14.9	7.7	18.7	0	12	.010	11.79	10
12	1200	0.0	0	19.4	7.6	21.5	0	456	.080	9.77	5
13	2300	259.0	113	1.0	71.7	12.3	0	1059	5.820	11.41	39
14	2300	238.0	104	2.5	56.9	14.6	0	13	.130	14.97	37
15	2300	211.0	92	4.5	55.0	14.4	0	111	.610	14.81	72
16	2300	194.0	85	5.8	52.3	14.3	0	190	.930	14.65	87
17	2300	129.0	56	10.4	37.8	15.8	0	43	.010	14.03	17
18	2300	64.0	28	14.9	28.4	16.0	0	15	.010	13.73	44
19	2300	46.0	20	16.2	25.4	16.5	0	21	.010	13.43	36
20	2300	20.0	9	17.8	21.9	17.1	0	63	.010	13.00	24
21	2300	5.0	2	18.7	19.5	17.6	0	77	.010	12.59	15
22	750	0.0	0	14.5	7.5	18.5	0	76	.010	11.53	5
23	2300	0.0	0	23.3	7.8	30.2	0	266	.010	6.95	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	6.3	7	1.7	.070	0.0	I	R	R	R
2	0.0	1.1	9	5.8	.060	.1	0.0	.93	7.7	5.1
3	0.0	6.7	9	1.4	.060	.3	0.0	1.48	2.1	.3
4	0.0	6.2	10	1.1	.050	.5	0.0	.60	.9	.1
5	0.0	7.3	11	2.9	.030	.4	0.0	.52	.8	.2
6	0.0	8.3	14	10.8	.060	1.7	0.0	.29	.5	.4
7	0.0	33.9	1904	13.6	0.000	0.0	0.0	.80	44.8	.3
8	0.0	33.1	2212	21.1	.040	1.9	0.0	.71	47.2	.5
9	0.0	10.2	717	28.0	0.000	0.0	0.0	.19	13.6	.5
10	0.0	111.3	8100	28.5	0.000	0.0	0.0	1.96	142.4	.5
11	0.0	.4	6	1.0	.070	0.0	I	R	R	R
12	0.0	15.9	56	.6	.120	0.0	I	R	R	R
13	0.0	198.6	22056	24.3	.025	2.8	0.0	1.75	194.5	.2
14	0.0	2.1	449	21.0	.055	5.7	0.0	.02	4.3	.2
15	0.0	17.9	1992	38.6	.035	3.2	0.0	.19	21.6	.4
16	0.0	28.9	2857	43.9	.060	5.1	0.0	.34	33.6	.5
17	0.0	5.2	25	6.9	.060	3.4	0.0	.09	.4	.1
18	0.0	1.4	19	13.7	0.000	0.0	0.0	.05	.7	.5
19	0.0	1.8	17	10.2	.065	1.3	0.0	.09	.9	.5
20	0.0	4.8	15	6.1	0.000	0.0	0.0	.55	1.8	.7
21	0.0	5.4	14	3.5	0.000	0.0	0.0	2.47	6.5	1.6
22	0.0	2.2	6	.5	.080	0.0	I	R	R	R
23	0.0	13.5	10	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	.531	GRAM/BHP HR
	CO	34.751	GRAM/BHP HR
	NO2	.349	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.829	LB/BHP HR

TABLE F-67 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINF 6-1P TEST-67 RUN-3 R+O CAT-AIR-64 08-14-72

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	750	0.0	0	15.5	7.9	18.8	0	169	.030	11.53	13
2	1200	5.0	1	16.2	11.2	19.4	0	25	.030	10.68	30
3	1200	20.0	5	15.8	12.4	19.0	0	145	.030	11.41	4
4	1200	45.0	10	14.3	13.9	18.5	0	129	.030	11.79	7
5	1200	62.0	14	13.4	15.2	18.0	0	129	.030	12.18	14
6	1200	125.0	29	9.4	20.6	16.9	0	112	.030	13.00	26
7	1200	186.0	42	5.5	28.0	14.6	0	295	.930	14.18	60
8	1200	205.0	47	4.5	29.5	14.7	0	278	.730	14.18	78
9	1200	230.0	53	2.8	30.7	14.9	0	100	.250	14.33	89
10	1200	249.0	57	.3	39.2	13.6	0	1055	4.260	14.33	70
11	750	0.0	0	15.3	8.0	18.1	0	9	.030	12.18	13
12	1200	0.0	0	19.3	7.7	21.0	0	368	.080	9.99	5
13	2300	259.0	113	1.0	71.2	12.4	0	1128	5.510	11.41	57
14	2300	238.0	104	2.6	57.2	14.6	0	25	.140	14.65	43
15	2300	211.0	92	4.6	54.5	14.4	0	124	.650	14.49	78
16	2300	194.0	85	5.8	52.5	14.3	0	222	1.000	14.33	96
17	2300	129.0	56	10.5	39.2	15.8	0	47	.060	13.73	23
18	2300	64.0	28	14.9	28.5	16.3	0	30	.060	13.43	34
19	2300	46.0	20	16.2	25.5	16.7	0	38	.010	13.14	34
20	2300	20.0	9	17.8	21.5	17.4	0	56	.010	12.59	23
21	2300	5.0	2	18.8	19.3	17.9	0	70	.010	12.18	15
22	750	0.0	0	15.3	7.7	18.4	0	59	.010	11.92	10
23	2300	0.0	0	23.3	7.9	29.8	0	266	.010	7.12	5

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	5.2	19	1.3	.070	0.0	I	R	R	R
2	0.0	1.2	29	4.7	.060	.1	0.0	1.05	25.2	4.1
3	0.0	7.1	30	.7	.060	.3	0.0	1.56	6.5	.1
4	0.0	6.9	32	1.2	.050	.5	0.0	.67	3.1	.1
5	0.0	7.3	34	2.6	.030	.4	0.0	.51	2.4	.2
6	0.0	8.0	43	6.2	.060	1.7	0.0	.28	1.5	.2
7	0.0	24.8	1576	16.7	0.000	0.0	0.0	.58	37.1	.4
8	0.0	24.9	1321	23.2	.040	1.9	0.0	.53	28.2	.5
9	0.0	9.5	482	28.2	0.000	0.0	0.0	.18	9.2	.5
10	0.0	100.3	8184	22.1	0.000	0.0	0.0	1.76	143.9	.4
11	0.0	.3	18	1.3	.070	0.0	I	R	R	R
12	0.0	12.7	56	.6	.120	0.0	I	R	R	R
13	0.0	213.8	21104	35.9	.025	2.8	0.0	1.89	186.1	.3
14	0.0	4.4	496	25.0	.055	5.7	0.0	.04	4.8	.2
15	0.0	20.3	2142	42.2	.035	3.2	0.0	.22	23.2	.5
16	0.0	34.4	3133	49.4	.060	5.1	0.0	.40	36.9	.6
17	0.0	6.1	156	9.8	.060	3.4	0.0	.11	2.8	.2
18	0.0	2.9	116	10.8	0.000	0.0	0.0	.10	4.1	.4
19	0.0	3.4	18	9.9	.065	1.3	0.0	.17	.9	.5
20	0.0	4.3	16	5.9	0.000	0.0	0.0	.49	1.8	.7
21	0.0	5.0	14	3.6	0.000	0.0	0.0	2.30	6.6	1.6
22	0.0	1.7	6	1.0	.080	0.0	I	R	R	R
23	0.0	13.3	10	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	.541	GRAM/BHP HR
	CO	34.017	GRAM/BHP HR
	NO2	.381	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.835	LB/BHP HR

TABLE F-68 VEHICLE EMISSION RESULTS

UNIT NO. 6	TEST NO. 1	DATE 9/28/73	MFGR. CODE 6
VEHICLE MODEL Compact		ENGINE 6-1	CURB WT. 12,750

YR. 1970
GVW 45,000
LA-4 DYNO TEST WEIGHT 25,000

BAROMETER 29.39 IN.HG.
DRY BULB TEMP. 93.0 DEG. F
REL. HUMIDITY 27 PCT.

WET BULB TEMP 68.0 DEG. F
SP. HUMIDITY 62.2 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 11.9 IN. H2O

BLOWER INLET PRESS., G1 7.0 IN. H2O
BLOWER INLET TEMP. 110 DEG. F

BAG RESULTS			
BAG NO.	1	2	3
BLOWER REVOLUTIONS	10988	16526	9860
HC SAMPLE METER READING/SCALE	35.7/3	10.3/3	16.6/3
HC SAMPLE PPM	357	103	166
HC BACKGRD METER READING/SCALE	1.8/3	2.7/3	1.9/3
HC BACKGRD PPM	18	27	19
CO SAMPLE METER READING/SCALE	55.1/1	31.1/1	52.5/1
CO SAMPLE PPM	5776	2926	5306
CO BACKGRD METER READING/SCALE	1.1/2	.9/1	.1/1
CO BACKGRD PPM	31	29	6
CO2 SAMPLE METER READING/SCALE	73.9/2	65.7/2	75.5/2
CO2 SAMPLE PERCENT	2.21	1.99	2.29
CO2 BACKGRD METER READING/SCALE	1.9/2	2.9/2	2.1/2
CO2 BACKGRD PERCENT	.05	.07	.05
NOX SAMPLE METER READING/SCALE	7.3/3	9.0/3	6.5/3
NOX SAMPLE PPM	21.9	12.0	19.5
NOX BACKGRD METER READING/SCALE	.9/3	.6/3	.3/3
NOX BACKGRD PPM	1.2	1.8	.9
HC CONCENTRATION PPM	343	80	155
CO CONCENTRATION PPM	5956	2295	5022
CO2 CONCENTRATION PCT	2.18	1.88	2.25
NOX CONCENTRATION PPM	21.0	10.5	18.8
HC MASS GRAMS	33.89	12.06	13.87
CO MASS GRAMS	1089.17	695.39	907.83
CO2 MASS GRAMS	6857.31	8977.88	6919.53
NOX MASS GRAMS	6.98	9.93	5.26

WEIGHTED MASS HC 9.61 GRAMS/MILE
WEIGHTED MASS CO 229.16 GRAMS/MILE
WEIGHTED MASS CO2 2078.09 GRAMS/MILE
WEIGHTED MASS NOX 1.93 GRAMS/MILE

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                        TABLE F-69              VEHICLE EMISSION RESULTS

UNIT NO.  6           TEST NO. 2          DATE 10/ 1/73                     MFGR. CODE    6                   YR.  1970
VEHICLE MODEL  Compact                    ENGINE 6-1                        CURB WT.  12,750                  GVW  45,000
                                                                            LA-4 DYNO TEST WEIGHT 25,000

BAROMETER  29.27 IN.HG.                                            WET BULB TEMP 73.0 DEG. F
DRY BULB TEMP.  77.0 DEG. F                                         SP. HUMIDITY 118.2 GRAINS/LB
REL. HUMIDITY     83 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                    1                2
     FINAL WT.,    GRAMS                     -0.00            -0.00
     INITIAL WT., GRAMS                      -0.00            -0.00
     DIFFERENCE   GRAMS                       0.00             0.00

     TOTAL EVAPORATIVE EMISSIONS                                         0.00 GRAMS

EXHAUST EMISSIONS

                                                                   BLOWER INLET PRESS., G1   6.8 IN. H2O
     BLOWER DIF. PRESS., G2,  11.5 IN. H2O                         BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                     1                2                3
     BLOWER REVOLUTIONS                      10864            16917             9977
     HC    SAMPLE  METER READING/SCALE      25.2/3            9.2/3           15.1/3
     HC    SAMPLE  PPM                         252               92              151
     HC    BACKGRD METER READING/SCALE       1.6/3            1.8/3            1.9/3
     HC    BACKGRD PPM                          16               18               19
     CO    SAMPLE  METER READING/SCALE      54.8/1           36.0/1           50.7/1
     CO    SAMPLE  PPM                        5720             2969             5000
     CO    BACKGRD METER READING/SCALE        .2/1             .4/1             .2/1
     CO    BACKGRD PPM                          12               24               12
     CO2   SAMPLE  METER READING/SCALE      78.1/2           66.4/2           75.6/2
     CO2   SAMPLE  PERCENT                    2.39             1.96             2.29
     CO2   BACKGRD METER READING/SCALE       1.3/2            2.2/3             .9/2
     CO2   BACKGRD PERCENT                     .03              .03              .02
     NOX   SAMPLE  METER READING/SCALE       5.8/3            3.4/3            5.0/3
     NOX   SAMPLE  PPM                        17.4             10.2             15.0
     NOX   BACKGRD METER READING/SCALE       0.0/3             .1/3             .1/3
     NOX   BACKGRD PPM                         0.0               .3               .3

     HC    CONCENTRATION PPM                   240               77              140
     CO    CONCENTRATION PPM                  5296             2753             4636
     CO2   CONCENTRATION PCT                  2.36             1.94             2.28
     NOX   CONCENTRATION PPM                  17.4             10.0             14.8
     HC    MASS GRAMS                        23.53            11.44            12.62
     CO    MASS GRAMS                      1050.49           825.21           844.62
     CO2   MASS GRAMS                      7399.46          9161.66          6548.20
     NOX   MASS GRAMS                         7.11             6.15             5.54

     WEIGHTED MASS HC        3.83 GRAMS/MILE
     WEIGHTED MASS CO      234.45 GRAMS/MILE
     WEIGHTED MASS CO2    2143.45 GRAMS/MILE
     WEIGHTED MASS NOX       1.65 GRAMS/MILE
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                    TABLE  F-70                 VEHICLE EMISSION RESULTS

UNIT NO.   6        TEST NO. 3            DATE 10/ 2/73             MFGR. CODE   6                  YR.  1970
VEHICLE MODEL   Compact                   ENGINE  6-0P              CURB WT.  12,750                GVW  45,000
                                                                    LA-4 DYNO TEST WEIGHT 25,000

BAROMETER  29.31 IN.HG.                                          WET BULB TEMP 76.0 DEG. F
DRY BULB TEMP.  89.0 DEG. F                                       SP. HUMIDITY 116.0 GRAINS/LB
REL. HUMIDITY      55 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                          1               2
     FINAL WT.,    GRAMS                            -0.00           -0.00
     INITIAL WT., GRAMS                             -0.00           -0.00
     DIFFERENCE    GRAMS                             0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                                0.00 GRAMS

EXHAUST EMISSIONS

                                                                 BLOWER INLET PRESS., G1   6.9 IN. H2O
     BLOWER DIF. PRESS., G2,  12.0 IN. H2O                       BLOWER INLET TEMP.  110 DEG. F

     BAG RESULTS
     BAG NO.                                           1               2              3
     BLOWER REVOLUTIONS                             10859           16563           9890
     HC    SAMPLE   METER READING/SCALE            71.2/3          46.1/3         72.3/3
     HC    SAMPLE   PPM                              712             461            723
     HC    BACKGRD METER READING/SCALE              1.8/3           2.5/3          2.3/3
     HC    BACKGRD PPM                                18              25             23
     CO    SAMPLE   METER READING/SCALE            64.5/1          47.2/1         65.7/1
     CO    SAMPLE   PPM                             7815            4445           8121
     CO    BACKGRD METER READING/SCALE               .2/1            .1/1           .1/1
     CO    BACKGRD PPM                                12               6              6
     CO2   SAMPLE   METER READING/SCALE            64.0/2          55.2/2         64.7/2
     CO2   SAMPLE   PERCENT                         2.05            1.58           2.08
     CO2   BACKGRD METER READING/SCALE              1.9/2           2.0/2          1.9/2
     CO2   BACKGRD PERCENT                           .05             .08            .05
     NOX   SAMPLE   METER READING/SCALE            37.0/3          27.1/3         44.9/3
     NOX   SAMPLE   PPM                            111.0            81.3          134.7
     NOX   BACKGRD METER READING/SCALE               .1/3            .6/3           .2/3
     NOX   BACKGRD PPM                                .3             1.8             .6

     HC    CONCENTRATION PPM                         698             440            705
     CO    CONCENTRATION PPM                        7357            4226           7647
     CO2   CONCENTRATION PCT                        2.02            1.54           2.04
     NOX   CONCENTRATION PPM                       110.8            79.8          134.2
     HC    MASS GRAMS                              68.48           65.83          63.01
     CO    MASS GRAMS                            1457.55         1276.89        1379.78
     CO2   MASS GRAMS                            6308.93         7338.79        5817.83
     NOX   MASS GRAMS                              44.64           49.04          49.27

     WEIGHTED MASS HC       17.49 GRAMS/MILE
     WEIGHTED MASS CO      358.68 GRAMS/MILE
     WEIGHTED MASS CO2   1782.36 GRAMS/MILE
     WEIGHTED MASS NOX      12.84 GRAMS/MILE
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TABLE F-71 VEHICLE EMISSION RESULTS

UNIT NO. 6 TEST NO. 4 DATE 10/ 3/73 MFGR. CODE 6 YR. 1970
VEHICLE MODEL Compact ENGINE 6-OP CURB WT. 12,750 GVW 45,000
LA-4 DYNO TEST WEIGHT 25,000

BAROMETER 29.29 IN.HG.
DRY BULB TEMP. 75.0 DEG. F
REL. HUMIDITY 87 PCT.

WET BULB TEMP 72.0 DEG. F
SP. HUMIDITY 115.6 GRAINS/LB

EVAPORATIVE EMISSIONS

CANISTER	1	2
FINAL WT., GRAMS	-0.00	-0.00
INITIAL WT., GRAMS	-0.00	-0.00
DIFFERENCE GRAMS	0.00	0.00

TOTAL EVAPORATIVE EMISSIONS 0.00 GRAMS

EXHAUST EMISSIONS

BLOWER DIF. PRESS., G2, 18.0 IN. H2O
BLOWER INLET PRESS., G1 6.8 IN. H2O
BLOWER INLET TEMP. 110 DEG. F

BAG RESULTS

BAG NO.	1	2	3
BLOWER REVOLUTIONS	10905	16566	9848
HC SAMPLE METER READING/SCALE	67.7/3	47.9/3	63.8/3
HC SAMPLE PPM	677	479	638
HC BACKGRD METER READING/SCALE	2.6/3	4.4/3	3.2/3
HC BACKGRD PPM	26	44	32
CO SAMPLE METER READING/SCALE	64.6/1	47.0/1	64.1/1
CO SAMPLE PPM	7840	4415	7715
CO BACKGRD METER READING/SCALE	.4/1	.4/1	.3/1
CO BACKGRD PPM	24	24	18
CO2 SAMPLE METER READING/SCALE	71.1/2	59.6/2	73.6/2
CO2 SAMPLE PERCENT	2.13	1.56	2.22
CO2 BACKGRD METER READING/SCALE	1.9/2	1.9/2	1.9/2
CO2 BACKGRD PERCENT	.05	.05	.05
NOX SAMPLE METER READING/SCALE	33.4/3	26.2/3	47.1/3
NOX SAMPLE PPM	100.2	78.6	141.3
NOX BACKGRD METER READING/SCALE	.4/3	1.0/3	.7/3
NOX BACKGRD PPM	1.2	3.0	2.1
HC CONCENTRATION PPM	657	442	613
CO CONCENTRATION PPM	7281	4139	7156
CO2 CONCENTRATION PCT	2.09	1.52	2.18
NOX CONCENTRATION PPM	99.3	76.1	139.7
HC MASS GRAMS	64.68	66.08	54.54
CO MASS GRAMS	1447.96	1250.47	1285.16
CO2 MASS GRAMS	6570.90	7252.21	6192.30
NOX MASS GRAMS	40.07	46.64	50.92

WEIGHTED MASS HC	16.66	GRAMS/MILE
WEIGHTED MASS CO	347.42	GRAMS/MILE
WEIGHTED MASS CO2	1819.28	GRAMS/MILE
WEIGHTED MASS NOX	12.39	GRAMS/MILE

APPENDIX G

TASK 7 - ENGINE 7

MASS EMISSION RESULTS BY
NINE-MODE FTP
NINE-MODE EPA
AND 23-MODE PROCEDURES

TRANSIENT MASS EMISSIONS BY:
1975 LIGHT DUTY FTP

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TABLE G-1. NINE MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 7

Test	Run	Engine Configuration*	Composite Emissions, Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO2 NDIR	NO2 CL	Cycle BSFC Lbs/Bhp-Hr
116	4	1973 Standard Baseline	4.17	7.18	65.53	14.63	13.70	0.641
116	5	1973 Standard Baseline	3.90	6.92	67.94	14.29	13.37	0.641
		Average	4.04	7.05	66.74	14.46	13.54	0.641
94	1	1973 Calif. Baseline, 9-12-73	3.31	3.65	23.08	9.02	8.33	0.763
94	2	1973 Calif. Baseline, 9-12-73	3.38	3.53	25.01	8.69	8.32	0.763
94	3	1973 Calif. Baseline, 9-12-73	3.31	3.52	24.43	8.84	8.33	0.763
		Average	3.33	3.57	24.17	8.85	8.33	0.763
102	1	1973 Calif. Baseline, 9-19-73	2.68	3.80	27.99	8.25	7.99	0.741
111	2	1973 Calif. Baseline, 10-10-73	3.67	4.76	27.81	7.91	7.04	0.776
111	3	1973 Calif. Baseline, 10-10-73	3.65	4.67	22.24	7.74	7.10	0.776
		Average	3.66	4.72	25.03	7.83	7.07	0.776
114	1	1973 Calif. Baseline, 10-11-73	4.00	4.82	27.62	7.37	6.68	0.769
131	1	1973 Calif. Baseline, 10-26-73	3.57	4.51	27.81	8.59	8.27	0.774
131	2	1973 Calif. Baseline, 10-26-73	3.35	4.25	26.74	8.44	8.24	0.774
		Average	3.46	4.38	27.28	8.52	8.26	0.774
101	1	No Air Injection	4.75	8.22	74.98	8.59	8.03	0.774
103	1	Decel Modulator	2.21	2.02	29.63	7.82	7.80	0.785
104	1	Timing 16 BTDC	5.35	5.76	36.38	10.78	10.40	0.652
104	2	Timing 12 BTDC	3.59	4.14	31.68	9.70	9.56	0.699
104	3	Timing 4 BTDC	3.02	2.98	21.63	7.27	6.99	0.791
104	4	Timing TDC	2.93	2.57	16.75	6.75	6.36	0.887

TABLE G-1 (Cont'd). NINE MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 7

Test	Run	Engine Configuration*	Composite Emissions, Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lbs/Bhp-Hr
113	1	Carb Jets 64	4.32	4.16	23.04	7.97	7.15	0.841
113	2	Carb Jets 65	3.76	4.41	26.01	7.38	6.75	0.766
113	3	Carb Jets 67	2.41	3.50	32.13	6.71	5.91	0.737
113	4	Carb Jets 68	2.40	4.08	36.28	6.03	5.27	0.710
112	1	EGR 5	4.28	4.76	24.46	5.26	4.74	0.866
112	2	EGR 10	4.34	3.98	24.34	4.65	4.13	0.856
112	3	EGR 15	5.39	5.23	19.83	5.02	4.35	0.954
115	1	O-Cat	0.73	0.24	5.71	7.28	6.82	0.745
115	2	O-Cat	0.68	0.20	3.97	6.76	6.37	0.745
		Average	0.71	0.22	4.84	7.02	6.60	0.745
115	4	O-Cat, No Air	1.62	1.93	18.63	6.26	5.69	0.738
126	1	O-Cat, EGR 10	1.09	0.44	3.75	7.39	6.94	0.922
126	2	O-Cat, EGR 10	0.71	0.32	5.98	5.78	5.20	0.922
126	3	O-Cat, EGR 10	1.12	0.54	3.37	6.40	5.84	0.922
		Average	0.97	0.43	4.37	6.52	5.99	0.922
129	2	O-Cat, EGR 10, 12 BTDC	1.25	0.50	8.30	5.74	5.43	0.816
129	3	O-Cat, EGR 10, 4 BTDC	1.56	0.57	7.45	4.73	4.38	1.067
130	3	O-Cat, EGR 10, 12 BTDC, 67 Jets	1.04	0.44	8.28	4.43	4.16	0.811
130	2	O-Cat, EGR 10, 8 BTDC, 67 Jets	0.95	0.33	9.29	4.05	3.66	0.906
130	1	O-Cat, EGR 10, 4 BTDC, 67 Jets	0.83	0.31	7.88	4.13	3.75	1.013

TABLE G-1 (Cont'd). NINE MODE FTP COMPOSITE EMISSIONS SUMMARY FOR ENGINE 7

Test	Run	Engine Configuration	Composite Emissions, Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO_2 NDIR	NO_2 CL	Cycle BSFC Lbs/Bhp-Hr
120	1	R&O Cat, 2 Air, 70 Jets, 60PV	1.20	0.73	3.34	0.78	0.41	0.746
120	2	R&O Cat, 2 Air, 70 Jets, 60PV	0.93	0.66	3.63	0.89	0.41	0.746
		Average	1.07	0.70	3.49	0.84	0.41	0.746
121	1	R&O Cat, 2 Air, 70 Jets, 56PV	1.05	0.88	5.98	0.90	0.47	0.753
121	2	R&O Cat, 2 Air, 68 Jets, 68PV	0.86	0.53	0.76	5.72	5.26	0.713
124	1	R&O Cat, 70 Jets, 60PV	0.86	0.58	3.98	0.91	0.44	0.751
124	2	R&O Cat, 70 Jets, 60PV	0.84	0.57	4.26	0.81	0.47	0.751
124	3	R&O Cat, 70 Jets, 60PV	0.75	0.50	4.76	0.67	0.45	0.751
		Average	0.82	0.55	4.33	0.80	0.45	0.751

*Engine 7-00, 1973 Standard Baseline as in Test 116.
Engine 7-0, 1973 California Baseline as in Tests 94, 102, 111, 114, and 131.
Engine 7-OP, Parametric Configuration as in Tests 101, 103, 104, 112, 113, 115, 126, 129, and 130.
Engine 7-1P, Parametric Configuration as in Tests 120 and 121.
Engine 7-1, Best Combination Configuration as in Test 124.

TABLE G-2. NINE MODE EPA COMPOSITE EMISSIONS SUMMARY FOR ENGINE 7

Test	Run	Engine Configuration*	Composite Emissions, Grams/Bhp-Hr HC NDIR	HC FID	CO NDIR	NO2 NDIR	NO2 CL	Cycle BSFC Lbs/Bhp-Hr
117	1	1973 Standard Baseline	4.43	6.69	53.06	16.31	15.68	0.621
117	2	1973 Standard Baseline	3.72	6.50	58.41	15.65	14.91	0.621
117	3	1973 Standard Baseline	3.84	6.73	59.27	15.46	14.87	0.621
		Average	4.00	6.64	56.91	15.81	15.15	0.621
96	1	1973 Calif. Baseline	3.24	2.99	25.33	8.28	7.43	0.691
96	2	1973 Calif. Baseline	3.73	3.01	26.08	7.55	7.13	0.691
96	3	1973 Calif. Baseline	3.32	3.10	22.30	8.58	8.09	0.691
		Average	3.43	3.03	24.57	8.14	7.55	0.691
127	1	O-Cat, EGR 10	0.76	0.32	3.16	4.69	4.38	0.731
127	2	O-Cat, EGR 10	0.68	0.25	3.51	4.40	4.80	0.731
		Average	0.72	0.29	3.34	4.55	4.59	0.731
127	4	O-Cat, EGR 5	0.70	0.28	3.67	5.46	4.97	0.721
127	3	O-Cat, EGR 15	1.03	0.41	2.51	4.46	4.22	0.745
123	1	R&O Cat, 70 Jets, 60PV	0.77	0.62	5.62	0.77	0.52	0.721
123	2	R&O Cat, 70 Jets, 60PV	0.79	0.56	4.59	0.86	0.54	0.721
123	3	R&O Cat, 70 Jets, 60PV	0.77	0.57	4.34	0.82	0.45	0.722
		Average	0.78	0.58	4.85	0.82	0.50	0.721

*Engine 7-00, 1973 Standard Baseline as in Test 117.
Engine 7-0, 1973 California Baseline as in Test 96.
Engine 7-0P, Parametric Configuration as in Test 127.
Engine 7-1, Best Combination Configuration as in Test 123.

TABLE G-3. 23-MODE COMPOSITE EMISSIONS SUMMARY FOR ENGINE 7

			Composite Emissions, Grams/Bhp-Hr					
			HC		CO	NO_2		Cycle BSFC
Test	Run	Engine Configuration*	NDIR	FID	NDIR	NDIR	CL	Lbs/Bhp-Hr
118	1	1973 Standard Baseline	----	9.89	85.69	----	10.67	0.649
118	2	1973 Standard Baseline	----	9.64	92.33	----	10.21	0.647
118	3	1973 Standard Baseline	----	10.14	87.92	----	10.52	0.647
		Average		9.89	88.65		10.47	0.648
100	1	1973 Calif. Baseline	----	4.93	20.62	----	6.12	0.665
100	2	1973 Calif. Baseline	----	5.21	20.76	----	6.23	0.672
100	3	1973 Calif. Baseline	----	5.59	25.22	----	6.20	0.678
		Average		5.24	22.20		6.18	0.672
128	1	O-Cat, EGR 10	----	0.40	5.80	----	4.75	0.710
128	2	O-Cat, EGR 10	----	0.38	5.74	----	4.25	0.710
		Average		0.39	5.77		4.50	0.710
125	1	R&O Cat, 70 Jets, 60PV	----	0.70	13.17	----	0.43	0.710
125	2	R&O Cat, 70 Jets, 60PV	----	0.72	11.81	----	0.42	0.713
125	3	R&O Cat, 70 Jets, 60PV	----	0.74	11.74	----	0.43	0.707
		Average		0.72	12.24		0.43	0.710

*Engine 7-00, 1973 Standard Baseline as in Test 118.
Engine 7-0, 1973 California Baseline as in Test 100.
Engine 7-OP, Parametric Configuration as in Test 128.
Engine 7-1, Best Combination Configuration as in Test 125.

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                        TABLE G-4. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-04  TEST 11  RUN -  1974 STANDARD          10-16-73       K =1.019     HUM = 81.2  GR/LB
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               CONCENTRATION AS MEASURED      TOTAL     FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR                  MAN.
MODE           HC       CO      CO2     NO    CARBON    CONS.      HC      CO     NO2   FACT.    HC        CO     NO2     HP       VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE         452   1.210   10.37     101   12.058     1769       72     358      5   .232    16.6       83     1.1      0     16.8
2 16 HG        173   1.550   13.54    1952   15.277    10478      128    2147    444   .077     9.9      165    34.2     31     16.0
3 10 HG        155    .870   13.65    3720   14.687    14379      164    1720   1225   .147    24.1      253   180.1     64     10.0
4 16 HG        139   1.390   13.56    2082   15.130    10478      104    1948    480   .077     8.0      150    36.9     31     16.0
5 19 HG        107    .660   13.69     896   14.464     6486       52     598    132   .057     3.0       34     7.5     12     19.0
6 16 HG        138   1.410   13.56    2113   15.119    10478      103    1924    493   .077     8.0      152    38.0     31     16.0
7  3 HG        147   2.720   13.18    1860   16.059    24948      247    8536    959   .113    27.9      965   108.4    104      3.0
8 16 HG        126   1.350   13.65    2130   15.136    10478       94    1888    490   .077     7.3      145    37.7     31     16.0
9 C.T.        1539   1.350    7.33     136   10.442     1905      306     502      8   .143    43.8       72     1.2      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      4.7       64    14.1
1 IDLE         452   1.210   10.37     101   12.058     1769       72     358      5   .232    16.6       83     1.1      0     16.8
2 16 HG        142   1.400   13.52    1945   15.073    10478      107    1966    450   .077     8.2      151    34.6     31     16.0
3 10 HG        135    .850   13.65    3856   14.644    14379      143    1686   1257   .147    21.0      248   184.8     64     10.0
4 16 HG        124   1.430   13.60    2127   15.164    10478       93    1996    487   .077     7.1      154    37.5     31     16.0
5 19 HG         92    .590   13.74     934   14.420     6486       45     534    146   .057     2.5       30     8.3     12     19.0
6 16 HG        123   1.360   13.62    2066   15.063    10478       92    1911    477   .077     7.1      147    36.7     31     16.0
7  3 HG        132   2.770   13.19    1844   16.099    24948      231    8671    974   .113    26.1      980   110.1    104      3.0
8 16 HG        119   1.450   13.61    2156   15.189    10478       89    2021    494   .077     6.8      156    38.0     31     16.0
9 C.T.        1432   1.420    7.47     158   10.442     1905      283     523     10   .143    40.5       75     1.4      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      4.3       64    14.4
1 IDLE         277   1.850   11.02     144   13.169     1769       40     502      6   .232     9.3      116     1.5      0     16.8
2 16 HG        137   1.390   13.63    1989   15.164    10478      102    1990    456   .077     7.9      149    35.1     31     16.0
3 10 HG        129    .850   13.70    3929   14.669    14379      136    1681   1277   .147    20.0      247   187.7     64     10.0
4 16 HG        118   1.460   13.57    2077   15.157    10478       88    2039    477   .077     6.8      157    36.7     31     16.0
5 19 HG         88    .620   13.73     945   14.445     6486       43     562    141   .057     2.4       32     8.0     12     19.0
6 16 HG        117   1.390   13.61    2071   15.126    10478       88    1945    476   .077     6.7      150    36.7     31     16.0
7  3 HG        135   2.750   13.17    1932   16.066    24948      226    8626    965   .113    25.6      975   109.1    104      3.0
8 16 HG        117   1.550   13.53    2190   15.206    10478       87    2157    501   .077     6.7      166    38.6     31     16.0
9 C.T.        1429   1.550    7.43     149   10.523     1905      279     567      9   .143    40.0       81     1.3      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      4.0       65    14.6
1 IDLE         277   1.850   11.02     144   13.169     1769       40     502      6   .232     9.3      116     1.5      0     16.8
2 16 HG        149   1.570   13.52    2009   15.251    10478      111    2179    458   .077     8.5      168    35.3     31     16.0
3 10 HG        134    .840   13.71    4016   14.695    14379      142    1660   1305   .147    20.9      244   191.8     64     10.0
4 16 HG        121   1.550   13.57    2118   15.251    10478       90    2151    483   .077     6.9      166    37.2     31     16.0
5 19 HG         87    .700   13.75     868   14.544     6486       42     631    129   .057     2.4       36     7.3     12     19.0
6 16 HG        121   1.500   13.54    2160   15.171    10478       90    2093    495   .077     6.9      161    38.1     31     16.0
7  3 HG        133   2.810   13.08    1895   16.034    24948      224    8832    979   .113    25.3      998   110.6    104      3.0
8 16 HG        115   1.520   13.46    2124   15.104    10478       86    2130    501   .077     6.6      164    38.6     31     16.0
9 C.T.        1474   1.590    7.35     147   10.532     1905      288     581     10   .143    41.2       83     1.4      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      4.0       67    14.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------      4.5       64    14.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------      4.0       66    14.5
FOUR CYCLE COMPOSITE -
                                          HC= NDIR 0.35(     4.5) + 0.65(     4.0) =     4.171   GM/BHP HR
                                          CO= NDIR 0.35(    63.8) + 0.65(    66.9) =    65.529   GM/BHP HR
                                          NO2=NDIR 0.35(    14.2) + 0.65(    14.5) =    14.363   GM/BHP HR
                                                            CORRECTED NO2 =    14.629   GM/BHP HR
                                                                     BSFC =      .641   LB/BHP HR


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               CONCENTRATION AS MEASURED      TOTAL     FUEL      CALCULATED GM/HR      WT.       WEIGHTED GM/HR                  MAN.
MODE           HC-FID   CO      CO2   NO-CL   CARBON    CONS.      HC      CO     NO2   FACT.  HC-FID      CO   NO2-CL    HP       VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE        6643   1.210   10.37      35   12.244     1769       96     353      2   .232    22.3       82      .4      0     16.8
2 16 HG       3208   1.550   13.54    1808   15.411    10478      218    2129    408   .077    16.8      164    31.4     31     16.0
3 10 HG       2807    .870   13.65    3700   14.801    14379      273    1707   1193   .147    40.1      251   175.4     64     10.0
4 16 HG       2635   1.390   13.56    2000   15.214    10478      181    1934    457   .077    14.0      149    35.2     31     16.0
5 19 HG       1228    .660   13.69     800   14.528     6486       79     595    119   .057     4.5       34     6.8     12     19.0
6 16 HG       2710   1.410   13.56    2020   15.241    10478      186    1958    461   .077    14.3      151    35.5     31     16.0
7  3 HG       3068   2.720   13.18    1730   16.207    24948      472    8458    884   .113    53.4      956    99.9    104      3.0
8 16 HG       2505   1.350   13.65    2000   15.251    10478      172    1874    455   .077    13.3      144    35.1     31     16.0
9 C.T.       25063   1.350    7.33      22   11.186     1905      427     466      1   .143    61.0       66      .2      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      7.6       63    13.1
1 IDLE        6643   1.210   10.37      35   12.244     1769       96     353      2   .232    22.3       82      .4      0     16.8
2 16 HG       2930   1.400   13.52    1800   15.213    10478      202    1948    412   .077    15.6      150    31.7     31     16.0
3 10 HG       2705    .850   13.65    3750   14.770    14379      263    1671   1212   .147    38.7      246   178.2     64     10.0
4 16 HG       2608   1.430   13.60    1980   15.291    10478      179    1979    450   .077    13.8      152    34.7     31     16.0
5 19 HG       1643    .590   13.79     890   14.544     6486       73     531    132   .057     4.2       30     7.5     12     19.0
6 16 HG       2561   1.360   13.57    1930   15.186    10478      177    1895    442   .077    13.6      146    34.0     31     16.0
7  3 HG       2840   2.770   13.18    1750   16.234    24948      436    8599    893   .113    49.3      972   100.9    104      3.0
8 16 HG       2410   1.450   13.61    2000   15.301    10478      165    2006    455   .077    12.7      154    35.0     31     16.0
9 C.T.       21212   1.420    7.47      21   11.011     1905      367     496      1   .143    52.5       71      .2      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      7.0       63    13.4
1 IDLE        5819   1.850   11.02      47   13.452     1769       77     491      2   .232    17.8      114      .5      0     16.8
2 16 HG       2820   1.390   13.63    1830   15.307    10478      196    1922    416   .077    15.1      148    32.1     31     16.0
3 10 HG       2655    .850   13.70    3840   14.815    14379      258    1666   1237   .147    37.9      245   181.9     64     10.0
4 16 HG       2619   1.460   13.57    1930   15.291    10478      179    2021    439   .077    13.8      156    33.8     31     16.0
5 19 HG       1654    .620   13.73     840   14.515     6486       74     560    125   .057     4.2       32     7.1     12     19.0
6 16 HG       2562   1.390   13.61    1920   15.256    10478      176    1928    438   .077    13.5      148    33.7     31     16.0
7  3 HG       3040   2.750   13.17    1730   16.224    24948      468    8592    883   .113    52.8      965    99.8    104      3.0
8 16 HG       2592   1.550   13.53    2020   15.339    10478      177    2139    458   .077    13.6      165    35.3     31     16.0
9 C.T.       24261   1.550    7.43      23   11.406     1905      405     523      1   .143    57.9       75      .2      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      7.2       65    13.4
1 IDLE        5819   1.850   11.02      47   13.452     1769       77     491      2   .232    17.8      114      .5      0     16.8
2 16 HG       3020   1.570   13.52    1850   15.392    10478      206    2159    418   .077    15.8      166    32.2     31     16.0
3 10 HG       2666    .840   13.71    3930   14.817    14379      259    1647   1266   .147    38.0      242   186.1     64     10.0
4 16 HG       2565   1.550   13.57    2000   15.376    10478      175    2134    452   .077    13.5      164    34.8     31     16.0
5 19 HG       1661    .700   13.75     780   14.616     6486       74     627    115   .057     4.2       36     6.6     12     19.0
6 16 HG       2574   1.500   13.54    2000   15.297    10478      176    2075    455   .077    13.6      160    35.0     31     16.0
7  3 HG       2846   2.810   13.08    1750   16.180    24948      447    8752    896   .113    50.5      989   101.2    104      3.0
8 16 HG       2471   1.520   13.46    2060   15.227    10478      170    2113    471   .077    13.1      163    36.2     31     16.0
9 C.T.       24036   1.590    7.35      22   11.344     1905      404     539      1   .143    57.7       77      .2      0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------      7.1       67    13.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------      7.3       63    13.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------      7.1       66    13.5
FOUR CYCLE COMPOSITE -
                                          HC= FID  0.35(     7.3) + 0.65(     7.1) =     7.129   GM/BHP HR
                                          CO= NDIR 0.35(    63.1) + 0.65(    65.6) =    64.769   GM/BHP HR
                                          NO2=CL   0.35(    13.3) + 0.65(    13.5) =    13.449   GM/BHP HR
                                                            CORRECTED NO2 =    13.698   GM/BHP HR
                                                                     BSFC =      .641   LB/BHP HR
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                         TABLE G-5. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-00  TEST 11[illegible] 1973 STANDARD          10-16-73      K =1.013      HUM = 79.2  GR/LB
-----------------------------------------------------------------------------------------------------------------
            CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE        HC      CO     CO2     NO     CARBON    CONS.      HC      CO     NO2    FACT.    HC       CO     NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE      253   1.980  10.87    121    13.123     1769       37     539      5    .232     8.5     125     1.3     0   16.8
2 16 HG     131   1.310  13.55   1862    15.001    10478       99    1848    432    .077     7.6     142    33.2    31   16.0
3 10 HG     131    .950  13.63   3721    14.721    14379      138    1874   1207    .147    20.3     276   177.4    64   10.0
4 16 HG     113   1.360  13.61   2021    15.042    10478       85    1907    466    .077     6.5     147    35.9    31   16.0
5 19 HG      83    .650  13.79    854    14.530     6486       40     586    127    .057     2.3      33     7.2    12   19.0
6 16 HG     119   1.370  13.64   2028    15.133    10478       85    1916    466    .077     6.6     148    35.9    31   16.0
7  3 HG     126   2.690  13.22   1853    16.046    24948      212    8448    956    .113    23.9     955   108.1   104    3.0
8 16 HG     108   1.380  13.61   2018    15.107    10478       81    1933    465    .077     6.2     149    35.8    31   16.0
9 C.T.     1488   1.900   2.35    126    10.352     1905      286     520      8    .143    42.3      74     1.1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.9      65    13.8
1 IDLE      253   1.980  10.87    121    13.123     1769       37     539      5    .232     8.5     125     1.3     0   16.8
2 16 HG     133   1.480  13.45   1884    15.074    10478      100    2078    435    .077     7.7     160    33.5    31   16.0
3 10 HG     121    .920  13.57   3762    14.621    14379      129    1828   1228    .147    18.9     269   180.6    64   10.0
4 16 HG     116   1.440  13.55   2123    15.115    10478       87    2016    489    .077     6.7     155    37.6    31   16.0
5 19 HG      78    .660  13.69    955    14.434     6486       38     599    142    .057     2.2      34     8.1    12   19.0
6 16 HG     111   1.460  13.50   2089    15.080    10478       83    2049    482    .077     6.4     158    37.1    31   16.0
7  3 HG     123   2.820  13.04   1822    16.043    24948      207    9015    941    .113    23.3    1019   106.3   104    3.0
8 16 HG     107   1.560  13.44   2156    15.116    10478       80    2184    496    .077     6.2     168    38.2    31   16.0
9 C.T.     1480   1.640   2.32    144    10.558     1905      288     598      9    .143    41.2      85     1.2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.8      69    14.0
1 IDLE      320   1.860  10.81    134    13.016     1769       47     511      6    .232    10.9     118     1.4     0   16.8
2 16 HG     129   1.580  13.30   1959    15.099    10478       97    2215    451    .077     7.4     171    34.8    31   16.0
3 10 HG     120    .920  13.57   3762    14.620    14379      127    1829   1225    .147    18.7     269   180.1    64   10.0
4 16 HG     112   1.550  13.43   2023    15.101    10478       84    2172    466    .077     6.5     167    35.9    31   16.0
5 19 HG      81    .750  13.62    976    14.457     6486       39     680    145    .057     2.2      39     8.3    12   19.0
6 16 HG     112   1.440  13.47   2071    15.031    10478       84    2028    479    .077     6.5     156    36.9    31   16.0
7  3 HG     125   2.790  13.05   1828    15.975    24948      211    8801    948    .113    23.8     995   107.1   104    3.0
8 16 HG     112   1.600  13.40   2110    15.121    10478       84    2240    485    .077     6.5     172    37.4    31   16.0
9 C.T.     1404   1.540   2.43    136    10.486     1905      275     565      8    .143    39.4      81     1.2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     3.8      68    14.0
1 IDLE      320   1.860  10.81    134    13.016     1769       47     511      6    .232    10.9     119     1.4     0   16.8
2 16 HG     141   1.470  13.34   2035    15.012    10478      106    2073    472    .077     8.2     160    36.3    31   16.0
3 10 HG     129    .900  13.52   3941    14.454    14379      133    1608   1302    .147    19.6     236   191.3    64   10.0
4 16 HG     117   1.630  13.36   2076    15.096    10478       88    2285    478    .077     6.8     176    36.8    31   16.0
5 19 HG      82    .740  13.55    856    14.384     6486       42     674    128    .057     2.4      38     7.3    12   19.0
6 16 HG     115   1.520  13.40   2098    15.044    10478       87    2139    485    .077     6.7     165    37.4    31   16.0
7  3 HG     126   2.860  12.99   1988    15.946    24948      212    9016    978    .113    24.0    1019   110.5   104    3.0
8 16 HG     110   1.690  13.43   2068    15.229    10478       82    2349    470    .077     6.3     181    36.2    31   16.0
9 C.T.     1461   1.680   2.28    147    10.538     1905      285     613      9    .143    40.8      88     1.3     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     4.0      69    14.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------     3.9      67    13.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------     3.9      69    14.2
FOUR CYCLE COMPOSITE =              HC- NDIR 0.35(    3.9) + 0.65(    3.9) =    3.895   GM/BHP HR
                                    CO- NDIR 0.35(   66.6) + 0.65(   68.6) =   67.942   GM/BHP HR
                                    NO2-NDIR 0.35(   13.9) + 0.65(   14.2) =   14.110   GM/BHP HR
                                                        CORRECTED NO2 =   14.290   GM/BHP HR
                                                                 BSFC =     .641   LB/BHP HR


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            CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR              MAN.
MODE       HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL  HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE     4778   1.980  10.87     50    13.328     1769       63     531      2    .232    14.7     123      .5     0   16.8
2 16 HG    2616   1.310  13.55   1700    15.122    10478      181    1834    391    .077    14.0     141    30.1    31   16.0
3 10 HG    2712    .950  13.63   3680    14.851    14379      263    1858   1183    .147    38.6     273   173.9    64   10.0
4 16 HG    2476   1.360  13.61   1850    15.218    10478      170    1892    423    .077    13.1     146    32.6    31   16.0
5 19 HG    1644    .650  13.79    750    14.604     6486       73     583    111    .057     4.2      33     6.3    12   19.0
6 16 HG    2477   1.370  13.64   1950    15.259    10478      170    1900    445    .077    13.1     146    34.2    31   16.0
7  3 HG    2954   2.690  13.22   1730    16.235    24948      455    8365    884    .113    51.4     945    99.9   104    3.0
8 16 HG    2391   1.380  13.61   1920    15.229    10478      165    1918    439    .077    12.7     148    33.8    31   16.0
9 C.T.    23348   1.900   2.35     23    11.085     1905      401     486      1    .143    57.4      69      .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     6.9      64    13.0
1 IDLE     4778   1.980  10.87     50    13.328     1769       63     531      2    .232    14.7     123      .5     0   16.8
2 16 HG    2931   1.480  13.45   1730    15.223    10478      202    2058    395    .077    15.5     158    30.4    31   16.0
3 10 HG    2552    .920  13.57   3300    14.745    14379      249    1812   1068    .147    36.6     266   157.1    64   10.0
4 16 HG    2448   1.440  13.55   2000    15.235    10478      168    2001    457    .077    13.0     154    35.2    31   16.0
5 19 HG    1614    .660  13.69    860    14.511     6486       72     596    128    .057     4.1      34     7.4    12   19.0
6 16 HG    2504   1.460  13.50   1900    15.210    10478      173    2032    435    .077    13.3     156    33.5    31   16.0
7  3 HG    2925   2.820  13.04   1700    16.203    24948      450    8927    869    .113    50.9    1009    98.2   104    3.0
8 16 HG    2306   1.560  13.44   2000    15.231    10478      159    2168    457    .077    12.2     167    35.2    31   16.0
9 C.T.    23390   1.640   2.32     24    11.299     1905      394     559      1    .143    56.4      80      .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     6.8      69    12.5
1 IDLE     5988   1.860  10.81     48    13.269     1769       80     501      2    .232    18.5     116      .5     0   16.8
2 16 HG    2755   1.580  13.30   1800    15.235    10478      189    2195    411    .077    14.6     169    31.6    31   16.0
3 10 HG    2552    .920  13.52   3720    14.745    14379      249    1812   1209    .147    36.6     266   177.0    64   10.0
4 16 HG    2505   1.550  13.43   1900    15.230    10478      172    2154    434    .077    13.3     166    33.4    31   16.0
5 19 HG    1649    .750  13.62    900    14.540     6486       76     676    133    .057     4.3      39     7.6    12   19.0
6 16 HG    2560   1.440  13.47   1900    15.166    10478      177    2010    436    .077    13.6     155    33.6    31   16.0
7  3 HG    2941   2.790  13.05   1700    16.134    24948      455    8715    873    .113    51.4     985    98.6   104    3.0
8 16 HG    2591   1.600  13.40   2000    15.259    10478      179    2219    456    .077    13.7     171    35.1    31   16.0
9 C.T.    21659   1.540   2.43     26    11.136     1905      371     532      1    .143    53.0      76      .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     6.9      68    13.2
1 IDLE     5988   1.860  10.81     48    13.269     1769       80     501      2    .232    18.5     116      .5     0   16.8
2 16 HG    2815   1.470  13.39   1850    15.142    10478      195    2055    425    .077    15.0     158    32.7    31   16.0
3 10 HG    2508    .900  13.52   3940    14.571    14379      248    1595   1291    .147    36.4     234   189.8    64   10.0
4 16 HG    2607   1.630  13.36   1930    15.231    10478      179    2265    441    .077    13.8     174    33.9    31   16.0
5 19 HG    1823    .740  13.55    740    14.472     6486       82     670    110    .057     4.7      38     6.3    12   19.0
6 16 HG    2589   1.520  13.40   2000    15.179    10478      179    2119    458    .077    13.8     163    35.3    31   16.0
7  3 HG    2878   2.860  12.99   1750    16.138    24948      445    8931    898    .113    50.3    1009   101.5   104    3.0
8 16 HG    2519   1.690  13.42   1920    15.362    10478      172    2328    435    .077    13.2     179    33.5    31   16.0
9 C.T.    22957   1.680   2.28     26    11.256     1905      389     574      1    .143    55.6      82      .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------     7.0      68    13.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------     6.9      66    12.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------     6.9      68    13.4
FOUR CYCLE COMPOSITE =              HC- FID  0.35(    6.9) + 0.65(    6.9) =    6.924   GM/BHP HR
                                    CO- NDIR 0.35(   65.9) + 0.65(   67.8) =   67.151   GM/BHP HR
                                    NO2-CL   0.35(   12.8) + 0.65(   13.4) =   13.204   GM/BHP HR
                                                        CORRECTED NO2 =   13.373   GM/BHP HR
                                                                 BSFC =     .641   LB/BHP HR
                         TABLE G-6. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-D   TEST 44  RUN 1   1973 CALIF ENGINE     09-12-73      K =1.035      HUM = 87.1  GR/LB
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             CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2     NO   CARBON   CONS.       HC      CO    NO2    FACT.    HC       CO    NO2     HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE        144   1.060   10.11     61  11.326    2359       32     446      4   .232     7.5     103    1.0      0    17.2
2 16 HG        38    .140   11.43    457  11.611   10569       37     257    138   .077     2.9      20   10.6     24    16.0
3 10 HG        39    .220   12.49   1678  12.752   16057       53     560    701   .147     7.8      82  103.1     61    10.0
4 16 HG        30    .120   11.42    536  11.572   10569       30     221    163   .077     2.3      17   12.5     24    16.0
5 19 HG        25    .140   14.10    244  14.267    7711       15     153     44   .057      .8       9    2.5      3    19.0
6 16 HG        28    .110   11.44    531  11.580   10569       28     203    161   .077     2.1      16   12.4     24    16.0
7  3 HG        31   1.190   13.52   1301  14.693   24857       57    3896    731   .113     6.4     440   82.6    105     3.0
8 16 HG        27    .110   11.55    600  11.689   10569       26     201    180   .077     2.0      15   13.9     24    16.0
9 C.T.       1953    .580    8.83    105  11.526    2948      591     300      9   .143    77.4      43    1.3      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.8      26    8.9
1 IDLE        144   1.060   10.11     61  11.326    2359       32     446      4   .232     7.5     103    1.0      0    17.2
2 16 HG        34    .120   11.50    517  11.657   10569       33     220    156   .077     2.6      17   12.0     24    16.0
3 10 HG        35    .190   12.54   1639  12.768   16057       48     484    684   .147     7.0      71  100.6     61    10.0
4 16 HG        30    .110   11.50    553  11.692   10569       29     202    167   .077     2.3      16   12.8     24    16.0
5 19 HG        26    .110   14.18    255  14.318    7711       15     120     46   .057      .9       7    2.6      3    19.0
6 16 HG        28    .120   11.62    559  11.770   10569       27     219    167   .077     2.1      17   12.8     24    16.0
7  3 HG        28    .990   13.70   1309  14.720   24857       51    3377    731   .113     5.8     382   82.6    105     3.0
8 16 HG        26    .110   11.56    616  11.698   10569       25     201    184   .077     2.0      15   14.2     24    16.0
9 C.T.       1679    .520    9.15    101  11.483    2948      466     270      9   .143    66.6      39    1.2      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.4      23    8.9
1 IDLE         79    .880   10.28     85  11.245    2359       17     357      6   .232     4.0      83    1.3      0    17.2
2 16 HG        38    .130   11.58    486  11.751   10569       37     236    145   .077     2.8      18   11.2     24    16.0
3 10 HG        37    .190   12.50   1729  12.730   16057       50     484    724   .147     7.4      71  106.4     61    10.0
4 16 HG        30    .130   11.59    580  11.752   10569       29     236    173   .077     2.2      18   13.3     24    16.0
5 19 HG        29    .150   14.13    261  14.310    7711       16     163     47   .057      .9       9    2.7      3    19.0
6 16 HG        30    .120   11.73    588  11.882   10569       29     216    174   .077     2.2      17   13.4     24    16.0
7  3 HG        30    .910   13.75   1421  14.692   24857       55    3110    798   .113     6.2     351   90.2    105     3.0
8 16 HG        28    .110   11.66    596  11.800   10569       27     199    177   .077     2.1      15   13.6     24    16.0
9 C.T.       1548    .610    9.72    106  12.002    2948      411     303      9   .143    58.7      43    1.2      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.1      22    8.4
1 IDLE         79    .880   10.28     85  11.245    2359       17     357      6   .232     4.0      83    1.3      0    17.2
2 16 HG        38    .130   11.60    508  11.771   10569       37     236    151   .077     2.8      18   11.7     24    16.0
3 10 HG        38    .200   12.60   1685  12.841   16057       51     505    700   .147     7.5      74  102.8     61    10.0
4 16 HG        32    .120   11.58    567  11.735   10569       31     218    170   .077     2.4      17   13.1     24    16.0
5 19 HG        30    .130   14.26    274  14.422    7711       17     140     49   .057     1.0       8    2.8      3    19.0
6 16 HG        30    .110   11.56    560  11.702   10569       29     201    168   .077     2.3      15   12.9     24    16.0
7  3 HG        31    .940   13.75   1416  14.723   24857       57    3206    794   .113     6.4     362   89.7    105     3.0
8 16 HG        29    .110   11.64    600  11.781   10569       28     199    179   .077     2.2      15   13.8     24    16.0
9 C.T.       1599    .500    9.29    103  11.517    2948      442     259      9   .143    63.2      37    1.3      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.2      22    8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------  3.6      25    8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------  3.1      22    8.6
FOUR CYCLE COMPOSITE -                     HC= NDIR 0.35(    3.6) + 0.65(    3.1) =    3.310   GM/BHP HR
                                           CO= NDIR 0.35(   24.9) + 0.65(   22.1) =   23.079   GM/BHP HR
                                           NO2=NDIR 0.35(    8.9) + 0.65(    8.6) =    8.709   GM/BHP HR
                                                             CORRECTED NO2 =    9.016   GM/BHP HR
                                                                      BSFC =     .763   LB/BHP HR
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             CONCENTRATION AS MEASURED    TOTAL    FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE        HC-FID    CO     CO2  NO-CL   CARBON   CONS.       HC      CO    NO2    FACT.  HC-FID     CO  NO2-CL    HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE       1986   1.060   10.11     20  11.369    2359       41     444      1   .232     9.6     103     .3      0    17.2
2 16 HG       304    .140   11.43    430  11.600   10569       28     258    130   .077     2.1      20   10.0     24    16.0
3 10 HG       475    .220   12.49   1562  12.757   16057       64     559    653   .147     9.4      82   96.0     61    10.0
4 16 HG       221    .120   11.42    500  11.562   10569       20     222    152   .077     1.6      17   11.7     24    16.0
5 19 HG       106    .140   14.10    188  14.251    7711        6     153     34   .057      .3       9    1.9      3    19.0
6 16 HG       194    .110   11.44    513  11.569   10569       18     203    156   .077     1.4      16   12.0     24    16.0
7  3 HG       277   1.190   13.52   1188  14.688   24857       47    3897    667   .113     5.3     440   75.4    105     3.0
8 16 HG       145    .110   11.55    550  11.675   10569       13     201    165   .077     1.0      15   12.7     24    16.0
9 C.T.      24350    .580    8.83     25  11.845    2948      606     292      2   .143    86.7      42     .3      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  4.1      25    7.8
1 IDLE       1986   1.060   10.11     20  11.369    2359       41     444      1   .232     9.6     103     .3      0    17.2
2 16 HG       298    .120   11.50    500  11.650   10569       27     220    151   .077     2.1      17   11.6     24    16.0
3 10 HG       363    .190   12.54   1613  12.766   16057       46     483    679   .147     6.7      71   99.8     61    10.0
4 16 HG       187    .110   11.50    525  11.629   10569       17     202    158   .077     1.3      16   12.2     24    16.0
5 19 HG       106    .110   14.18    200  14.301    7711        6     120     36   .057      .3       7    2.1      3    19.0
6 16 HG       166    .120   11.62    513  11.757   10569       15     218    153   .077     1.2      17   11.8     24    16.0
7  3 HG       199    .990   13.70   1175  14.710   24857       34    3379    659   .113     3.8     382   74.5    105     3.0
8 16 HG       138    .110   11.56    575  11.684   10569       13     201    173   .077     1.0      15   13.3     24    16.0
9 C.T.      20917    .520    9.15     20  11.762    2948      524     263      2   .143    75.0      38     .2      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.6      23    7.8
1 IDLE       1108    .880   10.28     35  11.271    2359       22     356      2   .232     5.2      83     .5      0    17.2
2 16 HG       291    .130   11.58    485  11.739   10569       26     236    145   .077     2.0      18   11.2     24    16.0
3 10 HG       398    .190   12.50   1575  12.730   16057       50     484    660   .147     7.4      71   97.0     61    10.0
4 16 HG       201    .130   11.59    538  11.740   10569       18     236    161   .077     1.4      18   12.4     24    16.0
5 19 HG       113    .150   14.13    225  14.291    7711        6     163     40   .057      .3       9    2.3      3    19.0
6 16 HG       173    .120   11.73    563  11.867   10569       15     216    166   .077     1.2      17   12.8     24    16.0
7  3 HG       199    .910   13.75   1300  14.680   24857       34    3113    731   .113     3.8     352   82.6    105     3.0
8 16 HG       139    .110   11.66    588  11.784   10569       12     199    175   .077     1.0      15   13.5     24    16.0
9 C.T.      24102    .610    9.72     30  12.740    2948      558     285      2   .143    79.8      41     .3      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.6      22    8.2
1 IDLE       1108    .880   10.28     35  11.271    2359       22     356      2   .232     5.2      83     .5      0    17.2
2 16 HG       270    .130   11.60    460  11.757   10569       24     236    137   .077     1.9      18   10.6     24    16.0
3 10 HG       378    .200   12.60   1600  12.838   16057       47     505    664   .147     7.0      74   97.7     61    10.0
4 16 HG       187    .120   11.58    538  11.719   10569       17     219    161   .077     1.3      17   12.4     24    16.0
5 19 HG       142    .130   14.26    213  14.404    7711        8     141     38   .057      .4       8    2.2      3    19.0
6 16 HG       181    .110   11.56    525  11.688   10569       16     201    158   .077     1.2      15   12.2     24    16.0
7  3 HG       192    .940   13.75   1288  14.709   24857       32    3209    723   .113     3.7     363   81.7    105     3.0
8 16 HG       139    .110   11.64    588  11.764   10569       12     200    175   .077     1.0      15   13.5     24    16.0
9 C.T.      22247    .500    9.29     30  12.015    2948      596     248      2   .143    78.1      35     .3      0    23.4
-----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------  3.5      22    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------  3.8      25    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------  3.6      22    8.2
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(    3.8) + 0.65(    3.6) =    3.649   GM/BHP HR
                                           CO- NDIR 0.35(   24.8) + 0.65(   22.1) =   23.029   GM/BHP HR
                                           NO2-CL   0.35(    7.8) + 0.65(    8.2) =    8.050   GM/BHP HR
                                                             CORRECTED NO2 =    8.333   GM/BHP HR
                                                                      BSFC =     .763   LB/BHP HR
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                         TABLE G-7.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-U    TEST 49   RUN 2    1974 CALIF ENGINE      09-12-73      K =1.095      HUM = 91.0  GR/LB
------------------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED       TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                   MAN.
MODE           HC       CO     CO2      NO     CARBON    CONS.       HC       CO      NO2     FACT.    HC        CO      NO2     HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        163    1.010    9.99      58    11.176     2359        37      431        4     .232     8.6      100      1.0      0      17.2
2 16 HG        36     .170   11.44     457    11.649    10569        35      312      138     .077     2.7       24     10.6     24      16.0
3 10 HG        38     .260   12.47    1606    12.771    16057        52      660      670     .147     7.6       97     98.5     61      10.0
4 16 HG        27     .160   11.54     513    11.729    10569        26      291      153     .077     2.0       22     11.8     24      16.0
5 19 HG        23     .150   14.16     226    14.335     7711        13      163       49     .057      .8        9      2.8      3      19.0
6 16 HG        26     .150   11.58     516    11.758    10569        25      272      154     .077     1.9       21     11.9     24      16.0
7  3 HG        27    1.140   13.69    1293    14.859    24857        49     3852      718     .113     5.5      435     81.1    105       3.0
8 16 HG        24     .150   11.69     526    11.866    10569        23      270      170     .077     1.8       21     13.1     24      16.0
9 C.T.       1814     .800    8.70      85    11.459     2948       504      416        7     .143    72.1       59      1.0      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.6       28      8.2
1 IDLE        163    1.010    9.99      54    11.176     2359        37      431        4     .232     8.6      100      1.0      0      17.2
2 16 HG        37     .180   11.70     502    11.920    10569        35      322      148     .077     2.7       25     11.4     24      16.0
3 10 HG        36     .250   12.65    1622    12.939    16057        48      627      668     .147     7.1       92     98.2     61      10.0
4 16 HG        29     .170   11.67     559    11.871    10569        28      306      165     .077     2.1       24     12.7     24      16.0
5 19 HG        26     .150   14.19     264    14.368     7711        15      163       47     .057      .9        9      2.7      3      19.0
6 16 HG        29     .160   11.80     561    11.991    10569        28      285      164     .077     2.1       22     12.6     24      16.0
7  3 HG        30     .990   13.84    1284    14.862    24857        54     3395      713     .113     6.1      384     80.6    105       3.0
8 16 HG        27     .150   11.64     584    11.819    10569        26      271      173     .077     2.0       21     13.3     24      16.0
9 C.T.       1622     .560    9.25      96    11.562     2948       447      288        7     .143    63.9       41      1.0      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.4       25      8.2
1 IDLE        113     .940   10.72      73    11.782     2359        24      380        5     .232     5.7       88      1.1      0      17.2
2 16 HG        38     .170   11.63     448    11.841    10569        37      307      148     .077     2.8       24     11.4     24      16.0
3 10 HG        37     .240   12.65    1635    12.930    16057        50      602      674     .147     7.3       89     99.1     61      10.0
4 16 HG        30     .170   11.66     585    11.862    10569        29      306      173     .077     2.2       24     13.3     24      16.0
5 19 HG        27     .190   14.21     260    14.429     7711        16      205       46     .057      .9       12      2.6      3      19.0
6 16 HG        28     .150   11.64     524    11.820    10569        27      271      156     .077     2.1       21     12.0     24      16.0
7  3 HG        30     .920   13.74    1342    14.792    24857        54     3293      751     .113     6.2      372     84.9    105       3.0
8 16 HG        26     .150   11.65     599    11.828    10569        25      271      178     .077     1.9       21     13.7     24      16.0
9 C.T.       1688     .580    9.17      88    11.573     2948       464      299        7     .143    66.4       43      1.1      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.4       24      8.4
1 IDLE        113     .940   10.72      73    11.782     2359        24      380        5     .232     5.7       88      1.1      0      17.2
2 16 HG        38     .170   11.54     456    11.751    10569        37      309      136     .077     2.8       24     10.5     24      16.0
3 10 HG        37     .240   12.58    1612    12.860    16057        50      605      668     .147     7.3       89     98.2     61      10.0
4 16 HG        31     .150   11.53     529    11.713    10569        30      273      158     .077     2.3       21     12.2     24      16.0
5 19 HG        27     .180   14.15     260    14.359     7711        16      195       46     .057      .9       11      2.6      3      19.0
6 16 HG        29     .160   11.68     547    11.871    10569        28      288      162     .077     2.1       22     12.4     24      16.0
7  3 HG        30     .920   13.81    1343    14.812    24857        54     3288      748     .113     6.1      372     84.5    105       3.0
8 16 HG        28     .150   11.62     601    11.800    10569        27      271      179     .077     2.1       21     13.8     24      16.0
9 C.T.       1618     .510    9.34      84    11.597     2948       444      262        7     .143    63.5       37      1.0      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.3       24      8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     3.5       26      8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     3.3       24      8.4
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     3.5) + 0.65(     3.3) =     3.381   GM/BHP HR
                                        CO- NDIR 0.35(    26.4) + 0.65(    24.3) =    25.013   GM/BHP HR
                                        NO2-NDIR 0.35(     8.2) + 0.65(     8.4) =     8.313   GM/BHP HR
                                                             CORRECTED NO2 =     8.688   GM/BHP HR
                                                                      BSFC =      .763   LB/BHP HR
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               CONCENTRATION AS MEASURED       TOTAL     FUEL        CALCULATED GM/HR          WT.        WEIGHTED GM/HR                   MAN.
MODE          HC-FID     CO     CO2   NO-CL    CARBON    CONS.       HC       CO      NO2     FACT.   HC-FID     CO    NO2-CL   HP      VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       2093    1.010    9.99      30    11.209     2359        44      429        2     .232    10.2      100       .5      0      17.2
2 16 HG       326     .170   11.44     460    11.643    10569        30      312      139     .077     2.3       24     10.7     24      16.0
3 10 HG       497     .260   12.47    1550    12.780    16057        62      660      647     .147     9.2       97     95.0     61      10.0
4 16 HG       236     .160   11.54     507    11.724    10569        21      291      152     .077     1.6       22     11.7     24      16.0
5 19 HG       103     .150   14.16     237    14.320     7711         6      163       42     .057      .3        9      2.4      3      19.0
6 16 HG       200     .150   11.58     517    11.750    10569        18      273      154     .077     1.4       21     11.9     24      16.0
7  3 HG       263    1.140   13.69    1200    14.856    24857        44     3854      667     .113     5.0      435     75.4    105       3.0
8 16 HG       152     .150   11.69     565    11.855    10569        14      270      167     .077     1.0       21     12.9     24      16.0
9 C.T.      25674     .800    8.70      43    12.067     2948       627      395        3     .143    89.7       56       .5      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     4.3       28      7.8
1 IDLE       2093    1.010    9.99      30    11.209     2359        44      429        2     .232    10.2      100       .5      0      17.2
2 16 HG       319     .180   11.70     485    11.912    10569        28      323      143     .077     2.2       25     11.0     24      16.0
3 10 HG       413     .250   12.65    1575    12.941    16057        51      627      649     .147     7.5       92     95.4     61      10.0
4 16 HG       207     .170   11.67     550    11.861    10569        18      306      163     .077     1.4       24     12.5     24      16.0
5 19 HG       121     .150   14.19     225    14.352     7711         7      163       40     .057      .4        9      2.3      3      19.0
6 16 HG       188     .160   11.80     550    11.979    10569        17      285      161     .077     1.3       22     12.4     24      16.0
7  3 HG       219     .990   13.84    1187    14.851    24857        36     3347      660     .113     4.0      378     74.5    105       3.0
8 16 HG       186     .150   11.64     575    11.806    10569        14      271      171     .077     1.1       21     13.2     24      16.0
9 C.T.      22033     .560    9.25      45    12.013     2948       541      278        4     .143    77.3       40       .5      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.7       25      7.8
1 IDLE       1913     .940   10.72      38    11.801     2359        28      380        3     .232     6.6       88       .6      0      17.2
2 16 HG       305     .170   11.63     475    11.831    10569        27      307      141     .077     2.1       24     10.8     24      16.0
3 10 HG       385     .240   12.65    1587    12.929    16057        48      602      654     .147     7.0       89     96.2     61      10.0
4 16 HG       201     .170   11.66     575    11.850    10569        18      306      170     .077     1.4       24     13.1     24      16.0
5 19 HG       127     .190   14.21     225    14.413     7711         7      205       40     .057      .4       12      2.3      3      19.0
6 16 HG       173     .150   11.64     520    11.807    10569        15      271      155     .077     1.2       21     11.9     24      16.0
7  3 HG       199     .920   13.74    1275    14.780    24857        33     3295      712     .113     3.8      372     80.4    105       3.0
8 16 HG       160     .150   11.65     575    11.816    10569        14      271      171     .077     1.1       21     13.1     24      16.0
9 C.T.      19167     .590    9.17      40    11.669     2948       485      296        3     .143    69.3       42       .5      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.3       24      8.1
1 IDLE       1913     .940   10.72      38    11.801     2359        28      380        3     .232     6.6       88       .6      0      17.2
2 16 HG       320     .170   11.54     450    11.742    10569        29      309      134     .077     2.2       24     10.4     24      16.0
3 10 HG       360     .240   12.58    1575    12.856    16057        45      606      653     .147     6.6       89     96.0     61      10.0
4 16 HG       207     .150   11.53     520    11.701    10569        19      274      156     .077     1.4       21     12.0     24      16.0
5 19 HG       131     .180   14.15     220    14.343     7711         7      195       39     .057      .4       11      2.2      3      19.0
6 16 HG       180     .160   11.68     537    11.858    10569        16      288      159     .077     1.2       22     12.2     24      16.0
7  3 HG       198     .920   13.81    1275    14.800    24857        33     3291      711     .113     3.8      372     80.3    105       3.0
8 16 HG       152     .150   11.62     587    11.785    10569        14      272      175     .077     1.0       21     13.5     24      16.0
9 C.T.      19690     .510    9.34      43    11.814     2948       490      257        4     .143    70.1       37       .5      0      23.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------     3.3       24      8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------------     4.0       26      7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------------     3.3       24      8.0
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     4.0) + 0.65(     3.3) =     3.525   GM/BHP HR
                                        CO- NDIR 0.35(    26.3) + 0.65(    24.2) =    24.979   GM/BHP HR
                                        NO2-CL   0.35(     7.8) + 0.65(     8.0) =     7.959   GM/BHP HR
                                                             CORRECTED NO2 =     8.319   GM/BHP HR
                                                                      BSFC =      .763   LB/BHP HR
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                        TABLE G-8. MASS EMISSIONS BY NINE-MODE FID
ENGINE 7-0   TEST 04  LOC 3   1973 CALIF ENGINE     09-12-74      K 81.065     HUM = 99.6  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR         WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2     FACT.     HC      CO     NO2    HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE        406    .870    9.87     65   11.070    2359     20     374       5     .232     16.3     87     1.1     0    17.2
2 16 HG        41    .170   11.66    455   11.874   10569     39     306     134     .077      3.0     24    10.3    24    16.0
3 10 HG        40    .260   12.64   1601   12.923   16057     58     627     660     .147      7.9     92    97.1    61    10.0
4 16 HG        24    .170   11.69    527   11.890   10569     27     305     156     .077      2.1     24    12.0    24    16.0
5 19 HG        24    .160   14.24    263   14.426    7711     14     173      47     .057       .8     10     2.7     3    19.0
6 16 HG        26    .170   11.84    561   12.038   10569     25     301     161     .077      1.9     23    12.4    24    16.0
7  3 HG        27   1.180   13.78   1270   14.984   24857     48    3953     699     .113      5.5    447    79.0   105     3.0
8 16 HG        25    .160   11.79    591   11.977   10569     24     285     173     .077      1.8     22    13.4    24    16.0
9 C.T.       1668    .600    9.06    102   11.440    2968    454     312       9     .143     65.6     45     1.2     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.7     27     6.1
1 IDLE        406    .870    9.87     65   11.070    2359     20     374       5     .232     16.3     87     1.1     0    17.2
2 16 HG        35    .160   11.67    495   11.868   10569     34     280     146     .077      2.6     22    11.3    24    16.0
3 10 HG        35    .230   12.67   1446   12.938   16057     47     577     678     .147      6.9     85    99.7    61    10.0
4 16 HG        27    .160   11.73    584   11.919   10569     26     287     172     .077      2.0     22    13.2    24    16.0
5 19 HG        24    .150   14.28    273   14.456    7711     14     162      48     .057       .8      9     2.6     3    19.0
6 16 HG        26    .160   11.77    562   11.958   10569     25     286     163     .077      1.9     22    12.6    24    16.0
7  3 HG        27   1.010   13.94   1285   14.979   24857     49    3386     708     .113      5.5    383    80.0   105     3.0
8 16 HG        26    .150   11.74    564   11.918   10569     25     269     172     .077      1.9     21    13.2    24    16.0
9 C.T.       1564    .530    9.42    101   11.639    2968    428     271       8     .143     61.2     39     1.2     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.5     26     8.3
1 IDLE        154    .850   10.71     82   11.766    2359     33     360       5     .232      7.7     84     1.3     0    17.2
2 16 HG        36    .160   11.68    520   11.869   10569     35     287     153     .077      2.7     22    11.8    24    16.0
3 10 HG        35    .230   12.75   1615   13.018   16057     47     573     661     .147      6.9     84    97.2    61    10.0
4 16 HG        28    .160   11.74    542   11.920   10569     27     287     160     .077      2.1     22    12.3    24    16.0
5 19 HG        25    .140   14.29    273   14.457    7711     14     151      48     .057       .8      9     2.8     3    19.0
6 16 HG        26    .150   11.79    583   11.968   10569     25     268     171     .077      1.9     21    13.2    24    16.0
7  3 HG        27    .970   13.43   1305   14.429   24857     49    3262     721     .113      5.5    369    81.5   105     3.0
8 16 HG        24    .140   11.66    595   11.826   10569     23     253     177     .077      1.8     19    13.6    24    16.0
9 C.T.       1480    .540    9.46    102   11.608    2968    408     277       9     .143     58.4     40     1.2     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.1     24     8.4
1 IDLE        154    .850   10.71     82   11.766    2359     33     360       5     .232      7.7     84     1.3     0    17.2
2 16 HG        35    .170   11.63    501   11.836   10569     34     307     149     .077      2.6     24    11.4    24    16.0
3 10 HG        36    .280   12.64   1628   12.954   16057     48     601     690     .147      7.1     88   101.5    61    10.0
4 16 HG        28    .140   11.62    586   11.790   10569     27     254     174     .077      2.1     20    13.4    24    16.0
5 19 HG        27    .170   14.24    254   14.469    7711     16     183      46     .057       .9     10     2.6     3    19.0
6 16 HG        27    .160   11.70    570   11.869   10569     26     287     168     .077      2.0     22    13.0    24    16.0
7  3 HG        28    .970   13.94   1327   14.930   24857     50    3262     733     .113      5.7    369    82.9   105     3.0
8 16 HG        25    .160   11.73    593   11.917   10569     24     287     175     .077      1.8     22    13.4    24    16.0
9 C.T.       1567    .550    9.44     99   11.662    2968    431     283       8     .143     61.6     40     1.2     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.2     24     8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------      3.6     26     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------      3.2     24     8.4
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(     3.6) + 0.65(     3.2) =     3.340   GM/BHP HR
                                    CO- NDIR 0.35(    25.7) + 0.65(    23.7) =    24.433   GM/BHP HR
                                    NO2-NDIR 0.35(     8.2) + 0.65(     8.4) =     8.303   GM/BHP HR
                                                         CORRECTED NO2 =     8.844   GM/BHP HR
                                                                  BSFC =      .763   LB/BHP HR
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              CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR         WT.       WEIGHTED GM/HR               MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2     FACT.   HC-FID    CO   NO2-CL   HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE        1814    .870    9.87     28   10.921    2359     36     388       2     .232      9.1     88      .5     0    17.2
2 16 HG        333    .170   11.66    450   11.663   10569     30     306     133     .077      2.3     24    10.2    24    16.0
3 10 HG        469    .250   12.64   1500   12.927   16057     58     627     619     .147      8.6     92    90.9    61    10.0
4 16 HG        222    .170   11.69    513   11.682   10569     20     305     151     .077      1.5     24    11.7    24    16.0
5 19 HG        107    .160   14.24    213   14.411    7711      6     173      38     .057       .3     10     2.2     3    19.0
6 16 HG        181    .170   11.84    526   12.028   10569     16     302     153     .077      1.2     23    11.8    24    16.0
7  3 HG        242   1.180   13.78   1176   14.984   24857     40    3954     647     .113      4.5    447    73.1   105     3.0
8 16 HG        139    .160   11.79    563   11.966   10569     12     286     165     .077       .9     22    12.7    24    16.0
9 C.T.       23466    .600    9.06     40   12.057    2968    586     296       3     .143     83.8     42      .4     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      4.0     27     7.1
1 IDLE        1814    .870    9.87     28   10.921    2359     36     388       2     .232      9.1     88      .5     0    17.2
2 16 HG        292    .160   11.67    480   11.869   10569     24     288     142     .077      2.0     22    10.6    24    16.0
3 10 HG        328    .230   12.67   1563   12.938   16057     42     577     644     .147      6.6     86    94.7    61    10.0
4 16 HG        174    .160   11.73    563   11.909   10569     17     287     166     .077      1.3     22    12.8    24    16.0
5 19 HG        107    .150   14.28    225   14.441    7711      6     162      40     .057       .3      9     2.4     3    19.0
6 16 HG        167    .160   11.77    538   11.947   10569     15     286     158     .077      1.1     22    12.2    24    16.0
7  3 HG        171   1.010   13.94   1200   14.967   24857     28    3388     662     .113      3.2    383    74.8   105     3.0
8 16 HG        142    .150   11.74    558   11.903   10569     12     269     164     .077       .9     21    12.6    24    16.0
9 C.T.       21186    .530    9.42     39   12.069    2968    518     262       3     .143     74.0     37      .4     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.5     26     7.1
1 IDLE        1495    .890   10.71     35   11.749    2359     30     361       2     .232      7.0     84      .5     0    17.2
2 16 HG        284    .160   11.68    490   11.878   10569     26     284     145     .077      1.9     22    11.1    24    16.0
3 10 HG        351    .230   12.75   1586   13.015   16057     40     573     635     .147      5.8     84    93.3    61    10.0
4 16 HG        181    .160   11.73    638   11.908   10569     16     287     159     .077      1.2     22    12.2    24    16.0
5 19 HG        113    .140   14.29    225   14.441    7711      6     151      40     .057       .3      9     2.3     3    19.0
6 16 HG        167    .150   11.79    550   11.957   10569     15     268     161     .077      1.1     21    12.4    24    16.0
7  3 HG        171    .970   13.93   1213   14.913   24857     28    3266     671     .113      3.2    369    75.8   105     3.0
8 16 HG        125    .140   11.66    568   11.813   10569     11     253     169     .077       .8     19    13.0    24    16.0
9 C.T.       21913    .560    9.46     40   12.191    2968    520     266       3     .143     74.3     38      .4     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.5     24     7.1
1 IDLE        1495    .890   10.71     35   11.749    2359     30     361       2     .232      7.0     84      .5     0    17.2
2 16 HG        277    .170   11.63    475   11.828   10569     25     307     141     .077      1.9     24    10.9    24    16.0
3 10 HG        370    .280   12.64   1643   12.958   16057     43     601     676     .147      6.3     88    99.4    61    10.0
4 16 HG        174    .140   11.62    541   11.779   10569     13     254     142     .077      1.0     20    10.9    24    16.0
5 19 HG        241    .170   14.24    175   14.484    7711     13     183      31     .057       .7     10     1.8     3    19.0
6 16 HG        176    .160   11.70    550   11.878   10569     16     288     162     .077      1.2     22    12.5    24    16.0
7  3 HG        171    .970   13.93   1238   14.913   24857     28    3266     685     .113      3.2    369    77.4   105     3.0
8 16 HG        124    .160   11.73    563   11.903   10569     11     287     166     .077       .9     22    12.8    24    16.0
9 C.T.       21175    .550    9.38     40   12.107    2968    520     273       3     .143     74.3     39      .5     0    23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------      3.4     24     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------      3.7     26     7.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------      3.6     24     7.9
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(     3.7) + 0.65(     3.6) =     3.621   GM/BHP HR
                                    CO- NDIR 0.35(    25.7) + 0.65(    23.7) =    24.405   GM/BHP HR
                                    NO2-CL   0.35(     7.7) + 0.65(     7.9) =     7.822   GM/BHP HR
                                                         CORRECTED NO2 =     8.332   GM/BHP HR
                                                                  BSFC =      .764   LB/BHP HR
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                    TABLE G-9. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-0   TEST 102 RUN 1   1973 CALIB [illegible]      9-19-74      = 31.081      HUM =107.6  GR/LB
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MODE        CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HP        WT.        WEIGHTED GM/HP            MAN.
            HC      CO      CO2     NO     CARBON   CONS.     HC      CO      NO2     FACT.   HC       CO     NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------------------
1 IDLE      301    .570    9.61     49    10.505    2223      69     258        4    .232    16.0     57      .6     0    16.3
2 16 HG      39    .200   11.[illegible]    363    11.612   10428      38     165      109    .077     2.9     28     8.4    25    16.0
3 10 HG      40    .250   12.33   1955    12.623   16057      56     642      614    .147     8.1     46    90.4    63    10.0
4 16 HG      27    .180   11.49    447    11.639   10428      26     326      133    .077     2.0     25    10.2    25    16.0
5 19 HG      24    .300   13.55    216    14.126    7439      19     318       36    .057      .8     17     2.0     2    19.0
6 16 HG      26    .200   11.50    439    11.728   10428      26     361      130    .077     1.9     24    10.0    25    16.0
7  3 HG      30   1.380    9.[illegible]   1273    14.773   25402      66    [illegible]      727    .113     6.3    [illegible]    82.1   107     3.0
8 16 HG      23    .160   11.41    426    11.546   10428      22     292      142    .077     1.7     22    11.0    25    16.0
9 C.T.     1299    .[illegible]    8.41     24    10.388    2268     305    [illegible]        6    .143    43.6     24      .8     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   2.9     26     7.5
1 IDLE      301    .57[illegible]    9.61     49    10.505    2223      69     266        3    .232    16.0     57      .8     0    16.3
2 16 HG      44    .1[illegible]   11.29    391    11.620   10426      43     346      117    .077     3.3     27     9.0    25    16.0
3 10 HG      46    .25[illegible]   12.45   1536    12.739   16057      48     [illegible]      639    .147     7.2     46    93.9    63    10.0
4 16 HG      29    .180   11.49    457    11.680   10428      27     290      136    .077     2.1     22    10.6    25    16.0
5 19 HG      23    .290   13.35    211    14.268    7439      18     305       37    .057      .9     17     2.1     2    19.0
6 16 HG      27    .210   11.5[illegible]    449    11.299   10428      26     329      133    .077     2.0     29    10.2    25    16.0
7  3 HG      29   1.620   13.59   1362    15.201   25402      52    5300      646    .113     5.9    640    73.5   107     3.0
8 16 HG      25    .160   11.47    466    11.657   10420      24     291      139    .077     1.9     22    10.7    25    16.0
9 C.T.     1129    .350    8.87     28    10.460    2268     275     153        6    .143    39.3     22      .8     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   2.7     31     7.5
1 IDLE      249    .500    9.96     46    10.629    2223      56     211        3    .232    13.0     49      .7     0    16.3
2 16 HG      46    .180   11.96    377    11.690   10428      45     326      112    .077     3.4     25     8.6    25    16.0
3 10 HG      39    .240   [illegible]   1520    12.752   16057      53     410      635    .147     7.8     40    93.3    63    [illegible]
4 16 HG      30    .170   11.44    428    11.642   10428      29     308      127    .077     2.2     24     9.8    25    16.0
5 19 HG      27    .300   13.96    212    14.289    7439      15     315       37    .057      .9     18     2.1     2    19.0
6 16 HG      28    .200   11.54    457    11.220   10428      27     360      135    .077     2.1     28    10.4    25    16.0
7  3 HG      29   1.300   13.[illegible]   1226    14.971   25402      63    4593      691    .113     6.0    519    78.0   107     3.0
8 16 HG      25    .160   11.[illegible]    510    11.747   10428      26     288      151    .077     1.9     22    11.6    25    16.0
9 C.T.     1154    .35[illegible]    8.93     [illegible]    10.672    2268     260     152        6    .143    37.4     23      .7     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   2.6     20     7.4
1 IDLE      243    .5[illegible]    9.[illegible]     46    10.629    2223      56     211        3    .232    13.0     49      .7     0    16.3
2 16 HG      61    .190   11.49    429    11.735   10428      49     383      127    .077     3.8     26     9.8    25    16.0
3 10 HG      41    .240   12.43   1633    12.704   16057      56     587      686    .147     8.2     86   100.7    63    10.0
4 16 HG      43    .180   11.60    517    11.816   10428      32     422      152    .077     2.5     25    11.7    25    16.0
5 19 HG      23    .310   13.34    236    14.331    7439      16     325       41    .057      .9     13     2.3     2    19.0
6 16 HG      28    .190   11.59    500    11.800   10428      27     333      147    .077     2.1     26    11.3    25    16.0
7  3 HG      24   1.290   13.49   1294    14.911   25402      53    4634      732    .113     6.0    [illegible]    [illegible]   107     3.0
8 16 HG      25    .160   11.62    486    11.707   10428      24     288      144    .077     1.9     22    11.1    25    16.0
9 C.T.     1116    .320    8.97     25    10.595    2268     259     161        5    .143    37.1     23      .7     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   2.6     21     8.0
AVERAGE SUM----(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------   2.8     [illegible]     7.5
AVERAGE SUM----(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------   2.6     [illegible]     7.7
FOUR CYCLE COMPOSITE -
                                      HC= NDIR 0.35(     2.8) + 0.65(     2.6) =     2.676   GM/BHP HR
                                      CO= NDIR 0.35(    29.5) + 0.65(    27.2) =    27.986   GM/BHP HR
                                      NO2=NDIR 0.35(     7.5) + 0.65(     7.7) =     7.629   GM/BHP HR
                                                              CORRECTED NO2 =     8.246   GM/BHP HR
                                                                       BSFC =      .741   LB/BHP HR
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MODE        CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HP        WT.        WEIGHTED GM/HP             MAN.
            HC-FID  CO      CO2     NO-CL  CARBON   CONS.     HC      CO      NO2     FACT.   HC-FID   CO     NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------------
1 IDLE     6396    .5[illegible]    9.61     24    10.815    2223     130     237        2    .232    30.3     55      .5     0    16.3
2 16 HG     526    .1[illegible]   11.32    380    11.623   10428      47     366      114    .077     3.7     28     8.8    25    16.0
3 10 HG     809    .250   12.33   1437    12.661   16057     103     640      605    .147    15.1     94    88.9    63    10.0
4 16 HG     360    .180   11.49    437    11.706   10428      32     325      130    .077     2.5     25    10.0    25    16.0
5 19 HG     226    .300   13.85    175    14.173    7439      12     318       30    .057      .7     18     1.7     2    19.0
6 16 HG     [illegible]    .200   11.50    437    11.730   10428      27     361      130    .077     2.1     28    10.0    25    16.0
7  3 HG     484   1.380    9.41   1238    14.788   25402      83    5615      706    .113     9.4    621    79.8   107     3.0
8 16 HG     243    .160   11.41    462    11.595   10428      23     242      139    .077     1.7     22    10.7    25    16.0
9 C.T.    21829    .380    8.61     35    11.223    2268     475     153        2    .143    68.0     22      .3     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   4.6     28     [illegible]
1 IDLE     6396    .520    9.61     24    10.815    2223     130     237        2    .232    30.3     55      .4     0    16.3
2 16 HG     526    .193   11.32    380    11.633   10428      47     361      114    .077     3.6     27     8.9    25    16.0
3 10 HG     615    .250   12.45   1512    12.761   16057      77     635      632    .147    11.4     [illegible]    [illegible]    63    10.0
4 16 HG     [illegible]    .160   11.49    460    11.680   10428      27     290      134    .077     2.1     22    10.3    25    16.0
5 19 HG     284    .290   13.96    175    14.269    7439      16     305       30    .057      .9     17     1.7     2    19.0
6 16 HG     306    .210   11.61    460    11.260   10428      27     378      133    .077     2.1     29    10.3    25    16.0
7  3 HG     420   1.520   13.60   1218    15.213   25402      71    5296      672    .113     8.1    598    75.9   107     3.0
8 16 HG     249    .160   11.47    462    11.655   10428      22     291      138    .077     1.7     22    10.6    25    16.0
9 C.T.    21268    .350    8.95     30    11.327    2268     426     142        2    .143    60.9     20      .3     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   4.2     31     7.2
1 IDLE     4137    .500    9.96     [illegible]    10.774    2223      85     208        2    .232    19.8     48      .5     0    16.3
2 16 HG     471    .180   11.9[illegible]    300    11.687   10428      42     326      116    .077     3.2     25     8.9    25    16.0
3 10 HG     603    .240   12.47   1475    12.776   16057      81     604      616    .147    11.9     90    90.6    63    10.0
4 16 HG     332    .170   11.49    425    11.693   10428      30     308      126    .077     2.3     24     9.7    25    16.0
5 19 HG     226    .300   13.96    187    14.293    7439      12     316       32    .057      .7     18     1.8     2    19.0
6 16 HG     277    .200   11.54    460    11.269   10428      25     360      133    .077     1.9     28    10.2    25    16.0
7  3 HG     370   1.300   13.60   1175    14.977   25402      63    4591      662    .113     7.1    519    74.8   107     3.0
8 16 HG     222    .160   11.56    500    11.742   10428      20     288      148    .077     1.5     22    11.4    25    16.0
9 C.T.    19117    .350    8.93     20    11.233    2268     366     143        1    .143    52.3     21      .2     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   3.6     27     7.[illegible]
1 IDLE     4137    .50[illegible]    9.[illegible]     20    10.774    2223      85     208        2    .232    19.8     48      .5     0    16.3
2 16 HG     416    .187   11.[illegible]    410    11.722   10428      37     343      122    .077     2.8     26     9.4    25    16.0
3 10 HG     531    .230   12.[illegible]   1600    12.713   16057      67     587      671    .147     9.9     86    98.6    63    10.0
4 16 HG     277    .180   11.60    500    11.808   10428      25     323      147    .077     1.9     25    11.4    25    16.0
5 19 HG     199    .310   13.94    200    14.320    7439      10     326       34    .057      .6     19     2.0     2    19.0
6 16 HG     249    .180   11.59    500    11.795   10428      22     323      147    .077     1.7     25    11.3    25    16.0
7  3 HG     341   1.290   13.59   1237    14.914   25402      58    4438      694    .113     6.6    502    78.5   107     3.0
8 16 HG     194    .160   11.62    436    11.690   10428      17     289      141    .077     1.3     22    10.9    25    16.0
9 C.T.    18261    .320    8.97     20    11.166    2268     371     152        1    .143    53.0     22      .2     0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------------   3.4     27     7.7
AVERAGE SUM----(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------   4.4     29     7.3
AVERAGE SUM----(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------   3.5     27     7.5
FOUR CYCLE COMPOSITE -
                                      HC= FID  0.35(     4.4) + 0.65(     3.5) =     3.799   GM/BHP HR
                                      CO= NDIR 0.35(    29.3) + 0.65(    27.1) =    27.887   GM/BHP HR
                                      NO2=CL   0.35(     7.3) + 0.65(     7.5) =     7.394   GM/BHP HR
                                                              CORRECTED NO2 =     7.991   GM/BHP HR
                                                                       BSFC =      .741   LB/BHP HR
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                     TABLE G-10. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 240  TEST=111  RUN=3   1973 CALIF ENGINE      10-10-73      K =1.058      HUM = 96.5  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE            HC     CO     CO2     NO    CARBON   CONS.     HC      CO      NO2   FACT.    HC      CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         414  1.020    9.01     24   10.522    2087      89     428       5   .232    20.6     99     1.2     0   16.9
2 16 HG         62   .150   11.06    338   11.257   10115      60     272     101   .077     4.6     21     7.8    21   16.0
3 10 HG         51   .220   12.34   1379   12.615   15740      69     558     569   .147    10.1     82    83.7    59   10.0
4 16 HG         40   .140   11.21    484   11.392   10115      37     251     119   .077     2.9     19     9.2    21   16.0
5 19 HG         41   .130   14.48    197   14.042    6940      16     130      32   .057      .9      7     1.8     0   19.0
6 16 HG         32   .143   11.21    402   11.385   10115      31     251     120   .077     2.4     19     9.2    21   16.0
7  3 HG         31  1.160   13.56   1041   14.853   24630      56    3885     573   .113     6.3    439    64.8   102    3.0
8 16 HG         28   .150   11.19    425   11.370   10115      27     270     126   .077     2.1     21     9.7    21   16.0
9 C.T.        1667  1.340    7.38    104   11.060    2223     360     569       7   .143    51.4     81     1.0     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.8     29     7.0
1 IDLE         414  1.020    9.01     24   10.527    2087      89     428       5   .232    20.6     99     1.2     0   16.9
2 16 HG         55   .140   11.08    350   11.280   10115      55     255     109   .077     4.2     20     8.4    21   16.0
3 10 HG         46   .190   12.34   1417   12.630   15740      62     478     586   .147     9.1     70    86.2    59   10.0
4 16 HG         37   .151   11.23    441   11.420   10115      35     268     130   .077     2.7     21    10.0    21   16.0
5 19 HG         42   .111   13.94    212   14.125    6940      17     109      35   .057     1.0      6     2.0     0   19.0
6 16 HG         33   .121   11.16    432   11.316   10115      32     217     128   .077     2.5     17     9.9    21   16.0
7  3 HG         31  1.070   13.21   1113   14.813   24630      56    3594     619   .113     6.3    406    69.9   102    3.0
8 16 HG         29   .130   11.31    483   11.470   10115      27     232     141   .077     2.1     18    10.9    21   16.0
9 C.T.        1522  1.330    8.26    120   11.224    2223     326     532       8   .143    46.6     76     1.1     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.5     27     7.4
1 IDLE         321   .980    9.44    114   10.767    2087      67     384       7   .232    15.6     89     1.7     0   16.9
2 16 HG         67   .160   11.34    441   11.472   10115      64     285     129   .077     4.9     22     9.9    21   16.0
3 10 HG         53   .180   12.41   1492   12.697   15740      71     576     614   .147    10.4     85    90.3    59   10.0
4 16 HG         42   .140   11.23    495   11.415   10115      40     251     146   .077     3.1     19    11.2    21   16.0
5 19 HG         38   .150   13.95    235   14.191    6940      20     139      38   .057     1.1      8     2.2     0   19.0
6 16 HG         38   .125   11.21    473   11.421   10115      36     304     139   .077     2.8     23    10.7    21   16.0
7  3 HG         42  1.040   13.70   1180   14.780   24630      67    3501     620   .113     7.6    396    70.0   102    3.0
8 16 HG         32   .120   11.17    432   11.325   10115      31     217     140   .077     2.4     17    10.8    21   16.0
9 C.T.        1614  1.460    8.17    135   11.339    2223     343     578       9   .143    49.0     83     1.3     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.6     28     7.8
1 IDLE         321   .980    9.44    114   10.767    2087      67     384       7   .232    15.6     89     1.7     0   16.9
2 16 HG         56   .140   11.34    424   11.390   10115      54     251     125   .077     4.1     19     9.6    21   16.0
3 10 HG         48   .190   12.34   1383   12.632   15740      65     478     576   .147     9.6     70    84.7    59   10.0
4 16 HG         34   .130   11.22    436   11.391   10115      36     233     129   .077     2.8     18     9.9    21   16.0
5 19 HG         38   .110   13.40    204   14.031    6940      20     110      33   .057     1.2      6     1.9     0   19.0
6 16 HG         35   .120   11.14    430   11.338   10115      34     216     127   .077     2.6     17     9.8    21   16.0
7  3 HG         39  1.030   13.61   1109   14.721   24630      69    3616     616   .113     7.8    409    69.6   102    3.0
8 16 HG         43   .130   11.20    459   11.362   10115      29     234     136   .077     2.2     18    10.5    21   16.0
9 C.T.        1747  1.410    7.36    102   11.147    2223     376     569       7   .143    53.8     81     1.0     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.7     27     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     3.7     28     7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     3.7     27     7.6
FOUR CYCLE COMPOSITE =                  HC= NDIR 0.35(    3.7) + 0.65(     3.7) =    3.671   GM/BHP HR
                                        CO= NDIR 0.35(   28.4) + 0.65(    27.5) =   27.812   GM/BHP HR
                                        NO2=NDIR 0.35(    7.2) + 0.65(     7.6) =    7.476   GM/BHP HR
                                                               CORRECTED NO2 =    7.919   GM/BHP HR
                                                                        BSFC =     .776   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR          MAN.
MODE          HC=FID    CO     CO2  NO=CL   CARBON   CONS.     HC      CO      NO2   FACT.  HC=FID    CO  NO2=CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        4195  1.030    9.11     15   10.720    2087     125     421       1   .232    28.9     98      .2     0   16.9
2 16 HG        603   .150   11.04    280   11.251   10115      55     272      87   .077     4.2     21     6.7    21   16.0
3 10 HG        728   .220   12.34   1225   12.619   15740      98     553     506   .147    14.4     81    74.5    59   10.0
4 16 HG        [illegible]   .140   11.21    350   11.391   10115      36     251     103   .077     2.8     19     7.9    21   16.0
5 19 HG        276   .130   13.98    134   14.038    6940      14     130      23   .057      .8      7     1.3     0   19.0
6 16 HG        366   .140   11.21    361   11.387   10115      32     251     107   .077     2.5     19     8.2    21   16.0
7  3 HG        576  1.160   13.56    925   14.863   24630      71    3883     509   .113     8.0    439    57.5   102    3.0
8 16 HG        331   .150   11.19    375   11.364   10115      26     270     111   .077     2.0     21     8.5    21   16.0
9 C.T.       27296  1.390    7.48     20   12.050    2223     513     518       1   .143    73.3     74      .2     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     5.1     29     6.2
1 IDLE        4195  1.030    9.01     15   10.780    2087     125     421       1   .232    28.9     98      .2     0   16.9
2 16 HG        603   .140   11.08    300   11.280   10115      54     256      89   .077     4.1     20     6.9    21   16.0
3 10 HG        638   .140   12.34   1288   12.650   15740      87     478     532   .147    12.8     70    78.2    59   10.0
4 16 HG        431   .150   11.23    400   11.420   10115      36     268     118   .077     2.7     21     9.1    21   16.0
5 19 HG        304   .110   13.98    150   14.120    6940      15     109      24   .057      .9      6     1.4     0   19.0
6 16 HG        365   .120   11.16    343   11.317   10115      33     217     108   .077     2.5     17     8.3    21   16.0
7  3 HG        390  1.070   13.71    950   14.820   24630      66    3592     529   .113     7.5    406    59.8   102    3.0
8 16 HG        376   .130   11.31    425   11.468   10115      25     232     124   .077     1.9     18     9.5    21   16.0
9 C.T.       19480  1.330    8.26     20   12.068    2223     457     495       1   .143    65.4     71      .2     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     4.7     27     6.5
1 IDLE        4495   .980    9.44     20   10.870    2087      86     380       1   .232    20.0     88      .3     0   16.9
2 16 HG        663   .160   11.29    395   11.466   10115      59     285     116   .077     4.5     22     8.9    21   16.0
3 10 HG        685   .230   12.41   1375   12.708   15740      85     575     568   .147    12.5     85    83.5    59   10.0
4 16 HG        414   .140   11.23    469   11.411   10115      37     251     132   .077     2.8     19    10.2    21   16.0
5 19 HG        318   .150   13.95    151   14.132    6940      16     139      24   .057      .9      8     1.4     0   19.0
6 16 HG        359   .120   11.21    461   11.416   10115      32     304     118   .077     2.5     23     9.1    21   16.0
7  3 HG        369  1.040   13.70   1100   14.777   24630      62    3502     605   .113     7.0    396    68.4   102    3.0
8 16 HG        294   .120   11.17    400   11.319   10115      26     217     115   .077     2.0     17     8.9    21   16.0
9 C.T.       27445  1.460    8.17     20   12.339    2223     494     532       1   .143    70.7     76      .2     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     4.6     27     7.1
1 IDLE        4495   .980    9.44     20   10.870    2087      86     380       1   .232    20.0     88      .3     0   16.9
2 16 HG        650   .140   11.19    345   11.395   10115      58     251     102   .077     4.5     19     7.8    21   16.0
3 10 HG        712   .190   12.39   1275   12.651   15740      89     478     527   .147    13.0     70    77.5    59   10.0
4 16 HG        414   .133   11.23    388   11.391   10115      37     233     114   .077     2.8     18     8.8    21   16.0
5 19 HG        409   .111   13.48    150   14.020    6940      15     110      25   .057      .9      6     1.4     0   19.0
6 16 HG        366   .120   11.19    335   11.337   10115      33     216     111   .077     2.5     17     8.6    21   16.0
7  3 HG        475  1.030   13.61    963   14.722   24630      80    3615     535   .113     9.0    408    60.4   102    3.0
8 16 HG        382   .130   11.20    413   11.369   10115      26     234     122   .077     2.0     18     9.4    21   16.0
9 C.T.       27159  1.410    7.86     20   11.996    2223     507     528       1   .143    72.5     75      .2     0   24.3
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     4.8     27     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     4.9     28     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     4.7     27     6.8
FOUR CYCLE COMPOSITE =                  HC= FID  0.35(    4.9) + 0.65(     4.7) =    4.764   GM/BHP HR
                                        CO= NDIR 0.35(   28.1) + 0.65(    27.2) =   27.532   GM/BHP HR
                                        NO2=CL   0.35(    6.3) + 0.65(     6.8) =    6.653   GM/BHP HR
                                                               CORRECTED NO2 =    7.042   GM/BHP HR
                                                                        BSFC =     .776   LB/BHP HR
                     TABLE G-11. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 9-C  TEST-111  RUN-3   1973 CALIF ENGINE      10-10-73       K =1.077      HUM =105.4  GR/LB
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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR              MAN.
MODE        HC      CO     CO2     NO     CARBON   CONS.     HC      CO      NO2     FACT.    HC      CO     NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE      351    .510    9.31     57   10.199    2087      78     211       4     .232    18.0     49      .9     0    16.9
2 16 HG      47    .150   11.13    314   11.331   10115      45     270      95     .077     3.5     21     7.3    21    16.0
3 10 HG      40    .180   12.19   1266   12.413   15740      55     461     529     .147     8.1     68    77.7    59    10.0
4 16 HG      28    .140   11.36    329   11.220   10115      27     255      98     .077     2.1     20     7.6    21    16.0
5 19 HG      24    .140   13.69    185   13.961    6940      16     142      31     .057      .9      8     1.8     0    19.0
6 16 HG      22    .120   11.06    374   11.224   10115      21     218     112     .077     1.6     17     8.6    21    16.0
7  3 HG      34    .920   13.51   1061   14.436   24630      44    2390     601     .113     5.0    270    67.9   102     3.0
8 16 HG      20    .130   11.08    420   11.232   10115      19     236     128     .077     1.5     18     9.9    21    16.0
9 C.T.     1481   1.120    7.61     46   10.761    2223     420     467       3     .143    60.0     67      .4     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     3.8     23     6.8
1 IDLE      351    .510    9.31     57   10.199    2087      78     211       4     .232    18.0     49      .9     0    16.9
2 16 HG      43    .121   11.01    369   11.176   10115      42     219     111     .077     3.2     17     8.5    21    16.0
3 10 HG      38    .160   12.17   1369   12.371   15740      52     411     578     .147     7.7     60    85.0    59    10.0
4 16 HG      28    .130   11.01    411   11.170   10115      27     238     124     .077     2.1     18     9.5    21    16.0
5 19 HG      25    .120   13.77    214   13.917    6940      13     121      35     .057      .8      7     2.0     0    19.0
6 16 HG      26    .120   11.05    398   11.198   10115      25     219     119     .077     2.0     17     9.2    21    16.0
7  3 HG      28    .910   13.56   1094   14.490   24630      51    3125     617     .113     5.8    353    69.8   102     3.0
8 16 HG      22    .130   11.08    449   11.234   10115      21     236     131     .077     1.6     18    10.1    21    16.0
9 C.T.     1828    .920    7.54    108   10.448    2223     430     394       8     .143    61.5     56     1.1     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     3.8     22     7.3
1 IDLE      266    .500    9.47     66   10.257    2087      58     205       4     .232    13.6     48     1.0     0    16.9
2 16 HG      45    .140   11.00    320   11.180   10115      44     256      96     .077     3.4     20     7.4    21    16.0
3 10 HG      41    .130   12.21   1333   12.384   15740      56     334     562     .147     8.3     49    82.7    59    10.0
4 16 HG      41    .120   11.02    408   11.173   10115      30     218     117     .077     2.3     17     9.0    21    16.0
5 19 HG      26    .120   13.76    186   13.908    6940      14     121      31     .057      .8      7     1.8     0    19.0
6 16 HG      26    .130   11.09    392   11.248   10115      25     236     117     .077     1.9     18     9.0    21    16.0
7  3 HG      30    .840   13.56   1127   14.432   24630      55    2896     639     .113     6.2    327    72.2   102     3.0
8 16 HG      23    .130   11.01    394   11.165   10115      23     238     119     .077     1.7     18     9.1    21    16.0
9 C.T.     1433   1.230    7.64     46   10.906    2223     403     531       6     .143    57.6     76      .9     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     3.6     22     7.2
1 IDLE      266    .500    9.47     66   10.257    2087      58     205       4     .232    13.6     48     1.0     0    16.9
2 16 HG      57    .130   11.34    361   11.232   10115      55     236     105     .077     4.3     18     8.1    21    16.0
3 10 HG      49    .150   12.15   1343   12.353   15740      67     386     568     .147     9.8     57    83.5    59    10.0
4 16 HG      35    .160   11.10    401   11.298   10115      34     288     119     .077     2.6     22     9.2    21    16.0
5 19 HG      33    .130   13.77    142   13.936    6940      18     131      30     .057     1.0      7     1.7     0    19.0
6 16 HG      32    .120   11.06    376   11.215   10115      31     219     113     .077     2.4     17     8.7    21    16.0
7  3 HG      34    .860   13.50   1121   14.397   24630      63    2972     637     .113     7.1    336    71.9   102     3.0
8 16 HG      26    .130   11.00    400   11.158   10115      25     238     120     .077     2.0     18     9.3    21    16.0
9 C.T.     1499   1.390    7.36     43   11.195    2223     365     558       6     .143    52.2     80      .9     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     3.6     23     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     3.8     22     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     3.6     22     7.2
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(     3.9) + 0.65(     3.6) =     3.650    GM/BHP HR
                                    CO- NDIR 0.35(    22.5) + 0.65(    22.1) =    22.244    GM/BHP HR
                                    NO2-NDIR 0.35(     7.1) + 0.65(     7.2) =     7.186    GM/BHP HR
                                                        CORRECTED NO2 =     7.232    GM/BHP HR
                                                                 BSFC =      .776    LB/BHP HR


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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR         WT.      WEIGHTED GM/HR                 MAN.
MODE       HC-FID   CO     CO2    NO-CL   CARBON   CONS.     HC      CO      NO2     FACT.   HC-FID   CO   NO2-CL    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE     5127    .510    9.31     16   10.333    2087     104     208       1     .232    24.0     48      .2     0    16.9
2 16 HG     607    .150   11.13    300   11.341   10115      54     270      89     .077     4.2     21     6.8    21    16.0
3 10 HG     664    .180   12.19   1175   12.437   15740      85     460     494     .147    12.4     68    72.6    59    10.0
4 16 HG     365    .140   11.95    300   11.227   10115      33     255      90     .077     2.5     20     6.9    21    16.0
5 19 HG     363    .140   13.64    138   13.866    6940      18     142      23     .057     1.0      8     1.3     0    19.0
6 16 HG     338    .120   11.04    339   11.234   10115      30     218     101     .077     2.3     17     7.8    21    16.0
7  3 HG     355    .920   13.54    925   14.495   24630      60    2996     552     .113     6.8    339    62.4   102     3.0
8 16 HG     263    .130   11.08    400   11.236   10115      24     236     120     .077     1.8     18     9.2    21    16.0
9 C.T.    28100   1.120    7.61     20   11.540    2223     541     436       1     .143    77.4     62      .2     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.0     22     6.3
1 IDLE     5127    .510    9.31     16   10.333    2087     104     208       1     .232    24.0     48      .2     0    16.9
2 16 HG     572    .120   11.01    320   11.187   10115      52     219      96     .077     4.0     17     7.4    21    16.0
3 10 HG     634    .160   12.17   1250   12.393   15740      81     410     527     .147    11.8     60    77.5    59    10.0
4 16 HG     386    .130   11.01    363   11.179   10115      35     238     109     .077     2.7     18     8.4    21    16.0
5 19 HG     282    .120   13.77    163   13.918    6940      14     121      27     .057      .8      7     1.5     0    19.0
6 16 HG     345    .120   11.05    350   11.205   10115      31     219     105     .077     2.4     17     8.1    21    16.0
7  3 HG     397    .910   13.56    925   14.500   24630      67    3122     550     .113     7.6    353    62.1   102     3.0
8 16 HG     276    .130   11.08    388   11.238   10115      25     236     116     .077     1.9     18     8.9    21    16.0
9 C.T.    27603    .920    7.54     20   11.220    2223     547     368       2     .143    78.2     53      .3     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     5.0     22     6.5
1 IDLE     3995    .500    9.47     20   10.320    2087      71     204       1     .232    16.4     47      .3     0    16.9
2 16 HG     529    .140   11.00    320   11.198   10115      52     255      96     .077     4.0     20     7.4    21    16.0
3 10 HG     641    .130   12.21   1250   12.404   15740      81     333     527     .147    11.9     49    77.4    59    10.0
4 16 HG     386    .120   11.02    375   11.179   10115      35     219     113     .077     2.7     17     8.7    21    16.0
5 19 HG     339    .120   13.76    138   13.914    6940      17     121      23     .057     1.0      7     1.3     0    19.0
6 16 HG     365    .130   11.09    375   11.255   10115      31     236     112     .077     2.4     18     8.6    21    16.0
7  3 HG     347    .840   13.56   1013   14.440   24630      68    2894     574     .113     7.6    327    64.8   102     3.0
8 16 HG     255    .130   11.01    375   11.165   10115      23     238     113     .077     1.8     18     8.7    21    16.0
9 C.T.    28144   1.290    7.64     20   11.745    2223     533     493       1     .143    76.2     71      .2     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     4.6     21     6.6
1 IDLE     3995    .500    9.47     20   10.320    2087      71     204       1     .232    16.4     47      .3     0    16.9
2 16 HG     566    .130   11.09    360   11.227   10115      51     237     108     .077     3.9     18     8.3    21    16.0
3 10 HG     655    .150   12.15   1275   12.365   15740      83     386     539     .147    12.3     57    79.2    59    10.0
4 16 HG     380    .160   11.10    388   11.298   10115      34     289     115     .077     2.6     22     8.9    21    16.0
5 19 HG     284    .130   13.77    138   13.929    6940      14     131      23     .057      .8      7     1.3     0    19.0
6 16 HG     331    .120   11.06    350   11.213   10115      30     219     105     .077     2.3     17     8.1    21    16.0
7  3 HG     411    .860   13.50   1025   14.401   24630      70    2971     582     .113     7.9    336    65.8   102     3.0
8 16 HG     276    .130   11.00    375   11.158   10115      25     238     113     .077     1.9     18     8.7    21    16.0
9 C.T.    25641   1.390    7.96     20   11.914    2223     478     524       1     .143    68.4     75      .2     0    24.3
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     4.4     22     6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     5.0     22     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     4.5     22     6.7
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(     5.0) + 0.65(     4.5) =     4.666    GM/BHP HR
                                    CO- NDIR 0.35(    22.3) + 0.65(    21.9) =    22.039    GM/BHP HR
                                    NO2-CL   0.35(     6.4) + 0.65(     6.7) =     6.590    GM/BHP HR
                                                        CORRECTED NO2 =     7.095    GM/BHP HR
                                                                 BSFC =      .776    LB/BHP HR
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                TABLE G-12. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-1  TEST 114  RUN 1   1973 CALIF ENGINE    10-11-73     K =1.057     HUM = 96.1  GR/LB
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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE        HC     CO     CO2     NO    CARBON   CONS.      HC     CO    NO2    FACT.    HC     CO    NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE     322   .820    9.65     69   10.718    2177       71    336     5    .232   16.5    78    1.1     0   17.1
2 16 HG     53   .133   10.94    285   11.127   10115       52    230    89    .077    4.0    18    6.9    22   16.0
3 10 HG     50   .213   12.29   1262   12.551   15876       68    536   526    .147   10.0    79   77.3    59   10.0
4 16 HG     39   .120   11.22    400   11.382   10115       37    216   118    .077    2.9    17    9.1    22   16.0
5 19 HG     42   .110   13.56    131   13.705    6809       23    110    28    .057    1.3     6    1.6     0   19.0
6 16 HG     35   .180   11.18    389   11.358   10115       34    252   114    .077    2.6    19    8.7    22   16.0
7  3 HG     41  1.150   13.52   1020   14.719   24812       75   3917   571    .113    8.5   443   64.5   104    3.0
8 16 HG     32   .130   11.27    437   11.435   10115       31    232   128    .077    2.5    18    9.9    22   16.0
9 C.T.    1330  1.540    7.50    105   11.090    2495      434    707     8    .143   62.1   101    1.1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.0    29    6.6
1 IDLE     322   .820    9.65     69   10.718    2177       71    336     5    .232   16.5    78    1.1     0   17.1
2 16 HG     50   .190   11.10    332   11.344   10115       48    262   110    .077    3.7    20    8.5    22   16.0
3 10 HG     48   .230   12.20   1239   12.482   15876       66    591   521    .147    9.7    87   76.6    59   10.0
4 16 HG     34   .170   11.15    380   11.361   10115       37    306   112    .077    2.8    24    8.6    22   16.0
5 19 HG     36   .160   13.41    142   13.609    6809       19    162    27    .057    1.1     9    1.5     0   19.0
6 16 HG     35   .230   11.41    385   11.678   10115       33    402   111    .077    2.5    31    8.5    22   16.0
7  3 HG     39   .960   13.09   1080   14.092   24812       76   3416   631    .113    8.6   386   71.3   104    3.0
8 16 HG     34   .330   10.93    437   11.297   10115       33    592   130    .077    2.5    46   10.0    22   16.0
9 C.T.    1330  1.600    7.84    105   11.308    2495      412    717     9    .143   58.9   102    1.1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.9    29    6.9
1 IDLE     310   .820    9.64     86   10.495    2177       67    351     6    .232   15.5    81    1.3     0   17.1
2 16 HG     57   .160   11.13    466   11.352   10115       55    288   108    .077    4.2    22    8.3    22   16.0
3 10 HG     51   .200   12.19   1322   12.445   15876       70    515   560    .147   10.3    76   82.3    59   10.0
4 16 HG     40   .160   11.17    407   11.379   10115       38    287   120    .077    3.0    22    9.3    22   16.0
5 19 HG     43   .110   13.44    176   13.596    6809       23    111    29    .057    1.3     6    1.7     0   19.0
6 16 HG     39   .150   11.21    304   11.402   10115       37    264   116    .077    2.9    21    8.9    22   16.0
7  3 HG     39   .860   13.66   1103   14.562   24812       72   2960   669    .113    8.1   334   75.6   104    3.0
8 16 HG     36   .130   11.13    400   11.299   10115       35    236   119    .077    2.7    18    9.2    22   16.0
9 C.T.    1322  1.520    7.86    109   11.245    2495      414    681     8    .143   59.2    97    1.1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     3.9    25    7.3
1 IDLE     310   .820    9.64     86   10.495    2177       67    351     6    .232   15.5    81    1.3     0   17.1
2 16 HG     63   .170   11.05    331   11.288   10115       61    308    99    .077    4.7    24    7.6    22   16.0
3 10 HG     54   .230   12.34   1271   12.528   15876       74    589   535    .147   10.9    87   78.6    59   10.0
4 16 HG     46   .180   11.16    401   11.390   10115       44    323   118    .077    3.4    25    9.1    22   16.0
5 19 HG     41   .150   13.59    180   13.774    6809       22    150    30    .057    1.2     9    1.7     0   19.0
6 16 HG     42   .190   11.26    382   11.485   10115       40    320   115    .077    3.1    25    8.8    22   16.0
7  3 HG     43  1.080   13.60   1123   14.726   24812       78   3674   628    .113    8.8   415   71.0   104    3.0
8 16 HG     38   .180   11.19    415   11.411   10115       36    322   122    .077    2.8    25    9.4    22   16.0
9 C.T.    1417  1.640    7.74    106   11.342    2495      432    729     8    .143   61.7   104    1.1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.1    29    6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     4.0    29    6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     4.0    27    7.1
FOUR CYCLE COMPOSITE -             HC- NDIR 0.35(     4.0) + 0.65(     4.0) =     4.003   GM/BHP HR
                                   CO- NDIR 0.35(    28.8) + 0.65(    27.0) =    27.623   GM/BHP HR
                                   NO2-NDIR 0.35(     6.7) + 0.65(     7.1) =     6.966   GM/BHP HR
                                                        CORRECTED NO2 =     7.366   GM/BHP HR
                                                                 BSFC =      .769   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE       HC-FID    CO     CO2  NO-CL  CARBON   CONS.      HC     CO    NO2    FACT.  HC-FID   CO   NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE    3288   .820    9.65     15   10.699    2177       67    333     1    .232   15.5    78     .2     0   17.1
2 16 HG    585   .133   10.94    233   11.128   10115       53    234    69    .077    4.1    18    5.3    22   16.0
3 10 HG    732   .213   12.29   1175   12.573   15876       92    536   493    .147   13.6    79   72.5    59   10.0
4 16 HG    407   .120   11.22    360   11.381   10115       36    215   103    .077    2.8    17    8.0    22   16.0
5 19 HG    422   .110   13.56    125   13.702    6809       21    110    21    .057    1.2     6    1.2     0   19.0
6 16 HG    366   .180   11.18    363   11.357   10115       33    252   107    .077    2.5    19    8.3    22   16.0
7  3 HG    483  1.150   13.52    950   14.718   24812       81   3916   532    .113    9.2   443   60.1   104    3.0
8 16 HG    291   .130   11.27    388   11.429   10115       26    232   114    .077    2.0    18    8.8    22   16.0
9 C.T.   24495  1.540    7.50     15   12.069    2495      610    693     1    .143   87.2    99     .1     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.1    28    6.0
1 IDLE    3289   .820    9.55     15   10.699    2177       67    337     1    .232   15.5    78     .2     0   17.1
2 16 HG    682   .190   11.10    295   11.352   10115       55    342    87    .077    4.3    26    6.7    22   16.0
3 10 HG    666   .230   12.20   1218   12.496   15876       83    590   514    .147   12.2    87   75.5    59   10.0
4 16 HG    374   .170   11.15    363   11.357   10115       33    306   107    .077    2.6    24    8.3    22   16.0
5 19 HG    334   .160   13.41    125   13.593    6809       14    162    21    .057     .8     9    1.2     0   19.0
6 16 HG    344   .230   11.41    350   11.674   10115       29    403   101    .077    2.3    31    7.8    22   16.0
7  3 HG    408   .960   13.09    987   14.091   24812       72   3415   577    .113    8.1   386   65.2   104    3.0
8 16 HG    368   .330   10.93    400   11.297   10115       24    592   119    .077    1.9    46    9.2    22   16.0
9 C.T.   24096  1.600    7.84     20   12.050    2495      540    669     1    .143   77.3    96     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.6    29    6.4
1 IDLE    4171   .820    9.64     20   10.977    2177       83    349     1    .232   19.2    81     .3     0   17.1
2 16 HG    580   .160   11.13    300   11.348   10115       52    288    89    .077    4.0    22    6.8    22   16.0
3 10 HG    643   .200   12.19   1225   12.453   15876       81    515   518    .147   11.9    76   76.2    59   10.0
4 16 HG    373   .160   11.17    335   11.367   10115       33    288   111    .077    2.6    22    8.5    22   16.0
5 19 HG    394   .110   13.44    125   13.589    6809       20    111    21    .057    1.1     6    1.2     0   19.0
6 16 HG    325   .150   11.21    360   11.392   10115       29    264   103    .077    2.2    21    7.9    22   16.0
7  3 HG    375   .860   13.66   1000   14.558   24812       64   2961   566    .113    7.2   335   63.9   104    3.0
8 16 HG    269   .130   11.13    335   11.287   10115       24    235   112    .077    1.9    18    8.6    22   16.0
9 C.T.   26952  1.520    7.86     20   12.075    2495      557    634     1    .143   79.6    91     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.8    25    6.4
1 IDLE    4171   .820    9.64     20   10.977    2177       83    349     1    .232   19.2    81     .3     0   17.1
2 16 HG    566   .170   11.05    285   11.277   10115       51    308    88    .077    3.9    24    6.8    22   16.0
3 10 HG    628   .230   12.34   1225   12.533   15876       80    589   515    .147   11.7    87   75.7    59   10.0
4 16 HG    366   .180   11.16    338   11.377   10115       33    323   100    .077    2.5    25    7.7    22   16.0
5 19 HG    275   .150   13.58    125   13.757    6809       14    150    21    .057     .8     9    1.2     0   19.0
6 16 HG    325   .180   11.26    360   11.473   10115       29    320   102    .077    2.2    25    7.9    22   16.0
7  3 HG    459  1.080   13.60   1037   14.725   24812       77   3676   580    .113    8.7   415   65.6   104    3.0
8 16 HG    263   .180   11.19    335   11.396   10115       23    323   111    .077    1.8    25    8.5    22   16.0
9 C.T.   28256  1.640    7.74     20   12.206    2495      578    677     1    .143   82.6    97     .2     0   24.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.9    29    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     4.8    28    6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     4.8    27    6.4
FOUR CYCLE COMPOSITE -             HC- FID  0.35(     4.8) + 0.65(     4.8) =     4.824   GM/BHP HR
                                   CO- NDIR 0.35(    28.5) + 0.65(    26.7) =    27.348   GM/BHP HR
                                   NO2-CL   0.35(     6.2) + 0.65(     6.4) =     6.318   GM/BHP HR
                                                        CORRECTED NO2 =     6.681   GM/BHP HR
                                                                 BSFC =      .769   LB/BHP HR
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                     TABLE G-13. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-8   TEST 131 RUN 1   1973 CALIF ENGINE    10-26-73    K 61,027    HUM = 89.2  GR/LB
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.         WEIGHTED GM/HR            MAN.
MODE          HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.    HC       CO     NO2    HP     VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE        221    .980   10.40    62   11.619    1996      41     340      4    .232     9.5      79      .8     0    17.0
2 16 HG        60    .180   11.31   456   11.555    9752      55     307    125    .077     4.2      24     9.6    20    16.0
3 10 HG        47    .280   12.81  1587   13.191   15740      61     677    612    .147     8.9     100    90.0    58    10.0
4 16 HG        45    .200   11.38   512   11.629    9752      41     334    143    .077     3.1      26    11.0    20    16.0
5 19 HG        40    .190   14.16   360   14.381    6809      20     183     38    .057     1.1      10     2.2     0    19.0
6 16 HG        34    .160   11.24   525   11.442    9752      36     275    154    .077     2.8      21    11.9    20    16.0
7  3 HG        32   1.190   13.39  1109   14.965   24545      57    3783    605    .113     6.4     428    68.4   101     3.0
8 16 HG        31    .160   11.21   555   11.403    9752      29     276    158    .077     2.2      21    12.1    20    16.0
9 C.T.       2133   1.750    8.16    97   12.296    2177     384     526      6    .143    55.6      90      .8     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.6      30     7.8
1 IDLE        221    .980   10.40    62   11.619    1996      41     340      4    .232     9.5      79      .8     0    17.0
2 16 HG        50    .160   11.11   469   11.324    9752      47     278    134    .077     3.6      21    10.3    20    16.0
3 10 HG        42    .260   12.43  1544   12.736   15740      56     644    634    .147     8.2      95    93.1    58    10.0
4 16 HG        33    .160   11.06   510   11.260    9752      35     280    147    .077     2.7      22    11.3    20    16.0
5 19 HG        24    .130   13.77   221   13.930    6809      15     128     36    .057      .8       7     2.0     0    19.0
6 16 HG        32    .150   11.06   526   11.235    9752      30     263    152    .077     2.3      20    11.7    20    16.0
7  3 HG        26    .930   13.84  1150   14.848   24585      46    3111    632    .113     5.3     351    71.5   101     3.0
8 16 HG        29    .160   11.06   530   11.250    9752      26     280    153    .077     2.0      22    11.7    20    16.0
9 C.T.       2102   1.890    8.11    96   12.270    2177     403     677      6    .143    57.6      97      .8     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.5      27     8.1
1 IDLE        269    .990   10.10    73   11.381    1996      51     351      4    .232    11.8      81     1.0     0    17.0
2 16 HG        49    .120   10.97   483   11.143    9752      46     212    140    .077     3.6      16    10.8    20    16.0
3 10 HG        40    .213   12.60  1639   12.853   15740      53     524    670    .147     7.8      77    98.4    58    10.0
4 16 HG        37    .130   11.00   477   11.140    9752      36     229    136    .077     2.7      18    10.5    20    16.0
5 19 HG        20    .101   13.75   217   13.880    6809      15      89     35    .057      .8       6     2.0     0    19.0
6 16 HG        32    .110   11.02   481   11.165    9752      30     194    139    .077     2.3      15    10.7    20    16.0
7  3 HG        27    .920   13.80  1294   14.749   24585      49    3098    716    .113     5.5     350    80.4   101     3.0
8 16 HG        27    .120   11.12   523   11.269    9752      25     210    150    .077     1.9      16    11.6    20    16.0
9 C.T.       2184   1.970    7.97    98   12.290    2177     418     704      6    .143    59.7     101      .8     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.6      26     8.6
1 IDLE        269    .990   10.10    73   11.381    1996      51     351      4    .232    11.8      81     1.0     0    17.0
2 16 HG        44    .120   11.04   385   11.213    9752      46     211    111    .077     3.5      16     8.6    20    16.0
3 10 HG        39    .233   12.31  1665   12.582   15740      53     581    692    .147     7.7      85   101.7    58    10.0
4 16 HG        36    .117   11.04   464   11.184    9752      34     194    136    .077     2.6      15    10.4    20    16.0
5 19 HG        24    .081   13.60   225   13.740    6809      18      80     37    .057      .9       5     2.1     0    19.0
6 16 HG        33    .110   11.04   492   11.186    9752      31     194    144    .077     2.4      15    11.1    20    16.0
7  3 HG        26   1.140   13.70  1259   14.858   24585      46    3777    691    .113     5.3     427    78.1   101     3.0
8 16 HG        27    .110   11.04   541   11.178    9752      25     194    157    .077     2.0      15    12.1    20    16.0
9 C.T.       2194   2.090    8.22   110   12.626    2177     394     728      6    .143    57.1     104      .9     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.5      29     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------     3.5      29     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------     3.6      27     8.6
FOUR CYCLE COMPOSITE =              HC= NDIR 0.35(    3.5) + 0.65(    3.6) =    3.567   GM/BHP HR
                                    CO= NDIR 0.35(   28.7) + 0.65(   27.3) =   27.811   GM/BHP HR
                                    NO2=NDIR 0.35(    8.0) + 0.65(    8.6) =    8.359   GM/BHP HR
                                                         CORRECTED NO2 =    8.582   GM/BHP HR
                                                                  BSFC =     .774   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.         WEIGHTED GM/HR               MAN.
MODE          HC-FID   CO     CO2   NO-CL  CARBON   CONS.     HC      CO     NO2    FACT.   HC-FID     CO    NO2-CL   HP     VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE       3592    .980   10.40    33   11.739    1996      61     337      2    .232    14.2      78      .4     0    17.0
2 16 HG       675    .180   11.31   440   11.557    9752      57     307    123    .077     4.4      24     9.5    20    16.0
3 10 HG       535    .280   12.81  1598   13.148   15740      69     677    599    .147    10.1     100    88.1    58    10.0
4 16 HG       424    .200   11.38   525   11.622    9752      36     334    146    .077     2.7      26    11.3    20    16.0
5 19 HG       265    .190   14.05   213   14.266    6809      13     183     34    .057      .7      10     1.9     0    19.0
6 16 HG       374    .160   11.24   480   11.438    9752      32     276    136    .077     2.5      21    10.5    20    16.0
7  3 HG       353   1.190   13.74   875   14.955   24585      42    3786    478    .113     4.7     428    54.0   101     3.0
8 16 HG       274    .160   11.21   500   11.397    9752      23     277    142    .077     1.8      21    10.9    20    16.0
9 C.T.      32448   1.750    8.36    45   13.348    2177     535     575      2    .143    76.6      82      .3     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.6      30     7.1
1 IDLE       3592    .980   10.40    33   11.739    1996      61     337      2    .232    14.2      78      .4     0    17.0
2 16 HG       724    .160   11.11   477   11.342    9752      62     278    134    .077     4.8      21    10.3    20    16.0
3 10 HG       652    .260   12.43  1488   12.748   15740      68     644    610    .147    10.0      95    89.7    58    10.0
4 16 HG       469    .160   11.06   525   11.267    9752      41     280    151    .077     3.1      22    11.6    20    16.0
5 19 HG       316    .130   13.77   218   13.932    6809      15     128     35    .057      .9       7     2.0     0    19.0
6 16 HG       417    .150   11.06   550   11.252    9752      35     263    155    .077     2.8      20    12.2    20    16.0
7  3 HG       373    .931   13.84  1075   14.847   24585      45    3111    591    .113     5.1     352    66.8   101     3.0
8 16 HG       323    .160   11.06   533   11.249    9752      26     280    153    .077     1.9      22    11.8    20    16.0
9 C.T.      31301   1.890    8.11    45   13.190    2177     527     690      2    .143    75.3      99      .4     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.5      27     7.8
1 IDLE       3721    .990   10.10    40   11.462    1996      65     348      2    .232    15.0      81      .5     0    17.0
2 16 HG       676    .120   10.97   460   11.158    9752      59     212    133    .077     4.5      16    10.3    20    16.0
3 10 HG       601    .213   12.50  1713   12.770   15740      74     523    701    .147    10.9      77   103.0    58    10.0
4 16 HG       407    .130   11.02   513   11.191    9752      35     224    148    .077     2.7      18    11.4    20    16.0
5 19 HG       240    .100   13.76   200   13.874    6809      12      94     33    .057      .7       6     1.9     0    19.0
6 16 HG       373    .110   11.02   500   11.167    9752      33     194    145    .077     2.5      15    11.2    20    16.0
7  3 HG       327    .920   13.40  1225   14.343   24585      38    3099    678    .113     4.3     350    76.6   101     3.0
8 16 HG       265    .123   11.12   513   11.266    9752      23     210    147    .077     1.8      16    11.4    20    16.0
9 C.T.      32758   1.970    7.97    45   13.216    2177     540     656      2    .143    77.2      94      .4     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.5      25     8.6
1 IDLE       3721    .990   10.10    40   11.962    1996      65     348      2    .232    15.0      81      .5     0    17.0
2 16 HG       621    .120   11.04   375   11.222    9752      54     211    108    .077     4.2      16     8.3    20    16.0
3 10 HG       565    .233   12.31  1608   12.596   15740      71     581    667    .147    10.4      85    98.1    58    10.0
4 16 HG       343    .110   11.04   475   11.184    9752      34     194    137    .077     2.6      15    10.6    20    16.0
5 19 HG       234    .080   13.68   200   13.743    6809      12      80     33    .057      .7       5     1.9     0    19.0
6 16 HG       345    .110   11.04   500   11.185    9752      30     194    145    .077     2.3      15    11.1    20    16.0
7  3 HG       256   1.130   13.70  1175   14.856   24585      42    3778    646    .113     4.8     427    73.0   101     3.0
8 16 HG       266    .110   11.04   537   11.177    9752      23     194    156    .077     1.8      15    12.0    20    16.0
9 C.T.      34175   2.090    8.22    43   13.728    2177     542     670      2    .143    77.5      96      .3     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     4.5      28     8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------     4.5      28     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------     4.5      27     8.4
FOUR CYCLE COMPOSITE =              HC= FID  0.35(    4.5) + 0.65(    4.5) =    4.506   GM/BHP HR
                                    CO= NDIR 0.35(   28.4) + 0.65(   27.0) =   27.505   GM/BHP HR
                                    NO2=CL   0.35(    7.4) + 0.65(    8.4) =    8.051   GM/BHP HR
                                                         CORRECTED NO2 =    8.272   GM/BHP HR
                                                                  BSFC =     .774   LB/BHP HR
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                    TABLE G-14,1975 EMISSIONS BY NINE-MODE FTP
ENGINE 7-0  TEST (3)  RUN 2   1973 CALIF ENGINE     10-26-73      K =1.021      HUM = 82.1  GR/LB
----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR         WT.        WEIGHTED GM/HR                 MAN.
MODE          HC       CO     CO2     NO    CARBON    CONS.     HC      CO      NO2     FACT.     HC      CO      NO2     HP      VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        207    .820   10.22     67    11.314    1996      39     310       4     .232     9.2      72       .9      0     17.0
2 16 HG        54    .170   11.08    438    11.228    9752      51     298     126     .077     3.9      23      9.7     20     16.0
3 10 HG        95    .260   12.47   1645    12.774   15740      60     647     673     .147     8.8      95     98.9     58     10.0
4 16 HG        38    .180   11.08    551    11.297    9752      32     314     126     .077     2.5      24      9.7     20     16.0
5 19 HG        35    .160   13.86    188    14.048    6809      18     157      29     .057     1.0       9      1.7      0     19.0
6 16 HG        38    .171   11.07    487    11.277    9752      32     297     123     .077     2.5      23      9.5     20     16.0
7  3 HG        33    .971   13.89   1159    14.896   24585      59    3234     635     .113     6.6     365     71.8    101      3.0
8 16 HG        39    .179   11.12    476    11.322    9752      28     296     136     .077     2.1      23     10.5     20     16.0
9 C.T.       1966   2.000    8.36     40    12.483    2177     370     705       5     .143    53.0     101       .7      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   3.4      28      8.1
1 IDLE        207    .820   10.22     67    11.314    1996      39     310       4     .232     9.2      72       .9      0     17.0
2 16 HG        52    .170   11.12    419    11.344    9752      49     295     118     .077     3.7      23      9.1     20     16.0
3 10 HG        95    .250   12.44   1596    12.774   15740      60     622     653     .147     8.8      91     95.9     58     10.0
4 16 HG        36    .160   10.98    568    11.174    9752      39     282     136     .077     2.6      22     10.9     20     16.0
5 19 HG        33    .150   13.94    213    14.126    6809      17     196      34     .057     1.0       8      1.9      0     19.0
6 16 HG        32    .139   11.07    486    11.235    9752      30     228     123     .077     2.3      18      9.5     20     16.0
7  3 HG        32    .971   13.90   1176    14.905   24585      57    3232     644     .113     6.4     365     72.8    101      3.0
8 16 HG        30    .149   11.11    511    11.282    9752      28     299     147     .077     2.2      19     11.3     20     16.0
9 C.T.       1996   1.877    8.44     43    12.412    2177     369     663       5     .143    52.7      95       .8      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   3.4      27      8.1
1 IDLE        179    .851   10.21     74    11.253    1996      34     305       4     .232     8.0      71      1.0      0     17.0
2 16 HG        64    .160   11.08    400    11.303    9752      54     279     115     .077     4.2      21      8.8     20     16.0
3 10 HG        43    .260   12.48   1650    12.791   15740      62     621     674     .147     9.2      91     99.1     58     10.0
4 16 HG        88    .170   11.14    502    11.351    9752      35     295     143     .077     2.7      23     11.0     20     16.0
5 19 HG        36    .170   13.96    237    14.159    6809      19     165      37     .057     1.1       9      2.1      0     19.0
6 16 HG        34    .160   11.03    462    11.227    9752      32     281     133     .077     2.5      22     10.3     20     16.0
7  3 HG        35    .930   13.87   1296    14.878   24585      62    3238     662     .113     7.1     366     74.8    101      3.0
8 16 HG        31    .160   11.16    493    11.393    9752      29     278     140     .077     2.2      21     10.8     20     16.0
9 C.T.       1075   1.361    8.31     43    12.475    2177     353     613       5     .143    50.5      88       .8      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   3.3      27      8.3
1 IDLE        179    .851   10.21     74    11.253    1996      34     305       4     .232     8.0      71      1.0      0     17.0
2 16 HG        58    .160   11.04    417    11.263    9752      54     280     120     .077     4.2      22      9.2     20     16.0
3 10 HG        49    .220   12.44   1682    12.713   15740      66     550     691     .147     9.6      81    101.6     58     10.0
4 16 HG        39    .169   11.12    503    11.322    9752      36     278     144     .077     2.8      21     11.1     20     16.0
5 19 HG        35    .140   13.98    222    14.148    6809      18     155      35     .057     1.0       9      2.0      0     19.0
6 16 HG        39    .190   11.09    466    11.267    9752      32     245     131     .077     2.4      19     10.1     20     16.0
7  3 HG        34    .931   13.87   1224    14.937   24585      61    3113     672     .113     6.9     352     76.0    101      3.0
8 16 HG        32    .150   11.16    513    11.335    9752      30     261     147     .077     2.3      20     11.3     20     16.0
9 C.T.       1895   1.649    8.30     43    12.437    2177     354     598       5     .143    51.2      85       .8      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   3.4      26      8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------   3.4      27      8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------   3.3      26      8.4
FOUR CYCLE COMPOSITE -               HC= NDIR 0.35(     3.4) + 0.65(     3.3) =     3.349   GM/BHP HR
                                     CO= NDIR 0.35(    27.4) + 0.65(    26.4) =    26.744   GM/BHP HR
                                     NO2=NDIR 0.35(     8.1) + 0.65(     8.4) =     8.267   GM/BHP HR
                                                          CORRECTED NO2 =     8.442   GM/BHP HR
                                                                   BSFC =      .774   LB/BHP HR
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              CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR         WT.        WEIGHTED GM/HR                  MAN.
MODE          HC-FID   CO     CO2    NO-CL  CARBON    CONS.     HC      CO      NO2     FACT.   HC-FID    CO     NO2-CL   HP      VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       3611    .820   10.22     35    11.451    1996      63     306       2     .232    14.6      71       .5      0     17.0
2 16 HG       414    .179   11.08    455    11.212    9752      36     299     131     .077     2.8      23     10.1     20     16.0
3 10 HG       397    .260   12.47   1588    12.770   15740      49     647     650     .147     7.2      95     95.5     58     10.0
4 16 HG       271    .180   11.08    580    11.287    9752      23     314     143     .077     1.8      24     11.0     20     16.0
5 19 HG       169    .160   13.86    200    14.027    6809       8     157      32     .057      .5       9      1.8      0     19.0
6 16 HG       290    .170   11.07    463    11.269    9752      25     297     133     .077     1.9      23     10.2     20     16.0
7  3 HG       214    .970   13.88   1100    14.881   24585      35    3237     603     .113     4.0     366     68.2    101      3.0
8 16 HG       248    .170   11.12    525    11.315    9752      21     296     150     .077     1.6      23     11.6     20     16.0
9 C.T.      33752   2.000    8.36     40    13.735    2177     535     640       2     .143    76.5      92       .3      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   4.2      27      7.9
1 IDLE       3611    .820   10.22     35    11.451    1996      63     306       2     .232    14.6      71       .5      0     17.0
2 16 HG       484    .170   11.12    420    11.338    9752      42     295     120     .077     3.2      23      9.2     20     16.0
3 10 HG       559    .250   12.48   1613    12.784   15740      69     622     659     .147    10.1      91     96.9     58     10.0
4 16 HG       400    .160   10.98    550    11.180    9752      35     282     130     .077     2.7      22     10.0     20     16.0
5 19 HG       261    .150   13.94    200    14.116    6809      13     196      38     .057      .7       8      1.8      0     19.0
6 16 HG       333    .130   11.07    460    11.233    9752      29     228     130     .077     2.2      18     10.0     20     16.0
7  3 HG       271    .970   13.90   1138    14.897   24585      45    3234     624     .113     5.0     365     70.5    101      3.0
8 16 HG       255    .149   11.11    525    11.276    9752      22     245     151     .077     1.7      19     11.6     20     16.0
9 C.T.      31985   1.820    8.44     39    13.508    2177     515     609       2     .143    73.7      87       .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   4.3      27      8.0
1 IDLE       3638    .850   10.21     40    11.424    1996      64     300       2     .232    14.7      70       .5      0     17.0
2 16 HG       682    .160   11.08    390    11.302    9752      54     279     112     .077     4.1      21      8.6     20     16.0
3 10 HG       666    .250   12.44   1625    12.797   15740      70     621     664     .147    10.2      91     97.6     58     10.0
4 16 HG       380    .170   11.15    500    11.348    9752      33     295     143     .077     2.5      23     11.0     20     16.0
5 19 HG       261    .170   13.96    200    14.146    6809      13     165      32     .057      .7       9      1.8      0     19.0
6 16 HG       331    .160   11.03    475    11.223    9752      29     281     137     .077     2.2      22     10.6     20     16.0
7  3 HG       284    .929   13.87   1159    14.858   24585      47    3240     631     .113     5.3     366     71.3    101      3.0
8 16 HG       255    .169   11.16    525    11.336    9752      22     278     150     .077     1.7      21     11.5     20     16.0
9 C.T.      30707   1.740    8.31     39    13.521    2177     494     566       2     .143    70.7      81       .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   4.3      27      8.1
1 IDLE       3638    .850   10.21     40    11.424    1996      64     300       2     .232    14.7      70       .5      0     17.0
2 16 HG       614    .160   11.04    430    11.261    9752      53     280     124     .077     4.1      22      9.5     20     16.0
3 10 HG       580    .220   12.44   1629    12.718   15740      72     550     668     .147    10.5      81     98.2     58     10.0
4 16 HG       373    .160   11.12    500    11.317    9752      32     278     143     .077     2.5      21     11.0     20     16.0
5 19 HG       248    .140   13.95    213    14.135    6809      12     156      34     .057      .7       9      1.9      0     19.0
6 16 HG       318    .149   11.09    500    11.262    9752      28     245     144     .077     2.1      19     11.1     20     16.0
7  3 HG       227    .930   13.87   1150    14.923   24585      38    3116     633     .113     4.3     352     71.6    101      3.0
8 16 HG       276    .150   11.16    538    11.328    9752      24     261     154     .077     1.8      20     11.8     20     16.0
9 C.T.      30691   1.609    8.30     39    13.459    2177     496     552       2     .143    71.0      74       .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------   4.2      25      8.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------   4.3      27      8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------   4.2      26      8.1
FOUR CYCLE COMPOSITE -               HC= FID  0.35(     4.3) + 0.65(     4.2) =     4.251   GM/BHP HR
                                     CO= NDIR 0.35(    27.1) + 0.65(    26.1) =    26.443   GM/BHP HR
                                     NO2=CL   0.35(     8.0) + 0.65(     8.1) =     8.071   GM/BHP HR
                                                          CORRECTED NO2 =     8.242   GM/BHP HR
                                                                   BSFC =      .774   LB/BHP HR
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                         TABLE G-15. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-HP TEST=101  POWER= [illegible] ATR          09-19-73      K =1.085     HUM =110.4  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE           HC      CO      CO2    NO    CARBON   CONS.     HC      CO      NO2    FACT.   HC       CO     NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE        484   1.350   10.06     12   11.933    2223      97     508      1    .232    22.6     118     .2     0   16.3
2 16 HG       121    .680   14.09    441   14.901   10529      92     970    127    .077     7.1      75    9.8    24   16.0
3 10 HG       112    .780   14.02   1292   14.921   16103     131    1700    644    .147    19.2     250   94.6    62   10.0
4 16 HG        85    .730   14.15    548   14.972   10529      65    1037    133    .077     5.0      80   10.2    24   16.0
5 19 HG        67    .600   14.38    226   14.752    7122      35     585     36    .057     2.0      33    2.1     1   19.0
6 16 HG        73    .860   14.17    579   15.109   10529      55    1210    139    .077     4.2      93   10.3    24   16.0
7  3 HG       159   4.190   12.61   1900   16.972   25266     256   12600    692    .113    28.9    1424   78.2   107    3.0
8 16 HG        73    .870   13.96    625   14.944   10529      56    1241    147    .077     4.3      96   11.3    24   16.0
9 C.T.       1906   1.550    7.41     77   11.418    2359     425     647      5    .143    60.8      92     .8     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       5.3      78    7.5
1 IDLE        484   1.350   10.06     12   11.933    2223      97     508      1    .232    22.6     118     .2     0   16.3
2 16 HG        94    .860   14.16    572   15.027   10529      75    1217    133    .077     5.8      94   10.2    24   16.0
3 10 HG       105    .860   13.97   1810   15.093   16103     121    2076    643    .147    17.8     305   94.6    62   10.0
4 16 HG        69    .740   14.12    580   14.935   10529      53    1053    136    .077     4.0      81   10.4    24   16.0
5 19 HG        57    .700   14.33    219   14.792    7122      30     681     34    .057     1.7      39    1.9     1   19.0
6 16 HG        65    .750   14.08    595   14.900   10529      50    1070    140    .077     3.8      82   10.7    24   16.0
7  3 HG       124   3.710   12.33   1424   16.569   25266     212   11428    723    .113    24.0    1291   81.7   107    3.0
8 16 HG        65    .880   14.05    631   15.010   10529      49    1260    147    .077     3.8      97   11.3    24   16.0
9 C.T.       1743   1.550    8.13     80   11.562    2359     384     634      5    .143    54.9      91     .8     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       4.8      76    7.7
1 IDLE        423   1.620   11.66     85   13.787    2223      74     544      5    .232    17.1     126    1.1     0   16.3
2 16 HG        93    .890   14.06    552   15.050   10529      70    1257    128    .077     5.4      97    9.9    24   16.0
3 10 HG        87    .840   13.99   1839   14.935   16103     113    1830    658    .147    16.6     269   96.8    62   10.0
4 16 HG        72    .990   14.06    622   15.118   10529      54    1392    144    .077     4.2     107   11.1    24   16.0
5 19 HG        66    .630   14.08    211   14.770    7122      29     619     34    .057     1.7      35    1.9     1   19.0
6 16 HG        68    .920   14.05    637   15.043   10529      51    1366    147    .077     3.9     105   11.4    24   16.0
7  3 HG       191   3.520   12.80   1441   16.461   25266     217   10913    760    .113    24.5    1233   85.9   107    3.0
8 16 HG        66    .970   14.06    664   15.001   10529      50    1233    155    .077     3.9      95   11.9    24   16.0
9 C.T.       1713   1.440    8.20     34   11.540    2359     378     615      5    .143    54.1      88     .7     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       4.6      75    8.0
1 IDLE        423   1.620   11.66     85   13.787    2223      74     544      5    .232    17.1     126    1.1     0   16.3
2 16 HG        97    .950   13.96    635   15.035   10529      73    1343    134    .077     5.6     103   10.3    24   16.0
3 10 HG        98    .770   13.97   1875   14.946   16103     115    1687    675    .147    16.9     248   99.3    62   10.0
4 16 HG        72    .940   14.16    661   15.118   10529      54    1392    150    .077     4.2     107   11.6    24   16.0
5 19 HG        63    .630   14.08    219   14.767    7122      28     614     35    .057     1.6      35    2.0     1   19.0
6 16 HG        69    .920   14.07    651   15.065   10529      52    1298    151    .077     4.0     100   11.6    24   16.0
7  3 HG       191   3.390   12.33   1490   16.261   25266     220   10640    769    .113    24.8    1202   86.9   107    3.0
8 16 HG        64    .740   14.36    623   14.869   10529      49    1058    146    .077     3.8      81   11.3    24   16.0
9 C.T.       1704   1.440    8.13     25   11.410    2359     380     601      5    .143    54.4      86     .7     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       4.6      73    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------       5.1      77    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------       4.6      74    8.1
FOUR CYCLE COMPOSITE -
                                           HC- NDIR 0.35(     5.1) + 0.65(     4.6) =    4.752   GM/BHP HR
                                           CO- NDIR 0.35(    77.4) + 0.65(    73.7) =   74.980   GM/BHP HR
                                           NO2-NDIR 0.35(     7.6) + 0.65(     8.1) =    7.917   GM/BHP HR
                                                              CORRECTED NO2 =    8.593   GM/BHP HR
                                                                       BSFC =     .744   LB/BHP HR


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               CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE           HC-FID    CO     CO2   NO-CL  CARBON   CONS.     HC      CO      NO2    FACT.  HC-FID    CO   NO2-CL  HP    VAC.
-------------------------------------------------------------------------------------------------------------------------
1 IDLE        9065   1.350   10.06     21   12.317    2223     164     492      1    .232    38.0     114     .3     0   16.3
2 16 HG       1541    .680   14.09    460   14.929   10529     112     968    108    .077     8.6      75    8.3    24   16.0
3 10 HG       2729    .780   14.02   1730   15.073   16103     292    1683    603    .147    42.9     247   88.6    62   10.0
4 16 HG       1295    .730   14.15    513   15.009   10529      91    1034    119    .077     7.0      80    9.2    24   16.0
5 19 HG        734    .600   14.39    170   14.754    7122      36     585     28    .057     2.0      33    1.6     1   19.0
6 16 HG       1263    .860   14.17    537   15.155   10529      87    1206    124    .077     6.7      93    9.5    24   16.0
7  3 HG       4640   4.190   12.61   1337   17.164   25266     536   12459    653    .113    60.5    1408   73.8   107    3.0
8 16 HG       1336    .870   13.96    535   14.954   10529      94    1237    134    .077     7.2      95   10.3    24   16.0
9 C.T.       27816   1.550    7.41     15   12.142    2359     540     608      1    .143    77.3      87     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       8.7      77    7.0
1 IDLE        9065   1.350   10.06     29   12.317    2223     164     492      1    .232    38.0     114     .3     0   16.3
2 16 HG       1207    .860   14.06    440   15.091   10529     119    1211    113    .077     9.2      93    8.7    24   16.0
3 10 HG       2561    .960   13.97   1775   15.186   16103     272    2056    625    .147    39.9     302   91.9    62   10.0
4 16 HG       1465    .740   14.12    525   14.996   10529      96    1049    122    .077     7.4      81    9.4    24   16.0
5 19 HG        824    .700   14.33    188   14.812    7122      40     680     30    .057     2.3      39    1.7     1   19.0
6 16 HG       1465    .750   14.08    550   14.966   10529      96    1065    128    .077     7.4      82    9.9    24   16.0
7  3 HG       3398   3.710   12.33   1375   16.770   25266     512   11291    688    .113    57.9    1276   77.7   107    3.0
8 16 HG       1424    .880   14.05    535   15.082   10529      99    1254    133    .077     7.6      97   10.3    24   16.0
9 C.T.       28329   1.550    8.13     15   12.513    2359     534     590      1    .143    76.4      84     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       8.5      75    7.3
1 IDLE        7436   1.620   11.66     40   14.128    2223     125     531      2    .232    29.1     123     .5     0   16.3
2 16 HG       1764    .880   14.06    496   15.124   10529     123    1251    114    .077     9.5      96    8.8    24   16.0
3 10 HG       2445    .840   13.99   1775   15.079   16103     261    1917    630    .147    38.4     266   92.5    62   10.0
4 16 HG       1538    .990   14.06    600   15.194   10529     107    1385    138    .077     8.2     107   10.6    24   16.0
5 19 HG        795    .630   14.08    175   14.790    7122      38     613     28    .057     2.2      35    1.6     1   19.0
6 16 HG       1623    .970   14.05    575   15.182   10529     113    1358    132    .077     8.7     105   10.2    24   16.0
7  3 HG       3362   3.520   12.80   1400   16.657   25266     511   10786    705    .113    57.7    1219   79.7   107    3.0
8 16 HG       1366    .970   14.06    588   15.067   10529      95    1228    136    .077     7.3      95   10.5    24   16.0
9 C.T.       26151   1.440    8.20     15   12.305    2359     501     577      1    .143    71.7      83     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       8.1      74    7.4
1 IDLE        7475   1.620   11.66     40   14.128    2223     125     531      2    .232    29.1     123     .5     0   16.3
2 16 HG       1679    .950   13.96    529   15.098   10529     117    1338    120    .077     9.0     103    9.3    24   16.0
3 10 HG       2401    .770   13.97   1913   14.970   16103     248    1673    647    .147    36.4     246   95.2    62   10.0
4 16 HG       1566    .940   14.16    598   15.197   10529     108    1395    135    .077     8.4     107   10.4    24   16.0
5 19 HG        710    .630   14.08    175   14.781    7122      34     619     28    .057     2.0      35    1.6     1   19.0
6 16 HG       1544    .920   14.07    575   15.149   10529     111    1291    133    .077     8.5      99   10.2    24   16.0
7  3 HG       3361   3.390   12.33   1913   16.956   25266     516   10519    720    .113    58.3    1188   81.4   107    3.0
8 16 HG       1251    .740   14.06    600   14.925   10529      88    1054    140    .077     6.8      81   10.8    24   16.0
9 C.T.       25254   1.440    8.13     15   12.096    2359     493     567      1    .143    70.4      81     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------       7.9      72    7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------       8.6      76    7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------       8.0      73    7.5
FOUR CYCLE COMPOSITE -
                                           HC- FID  0.35(     8.6) + 0.65(     8.0) =    8.222   GM/BHP HR
                                           CO- NDIR 0.35(    76.4) + 0.65(    72.7) =   74.015   GM/BHP HR
                                           NO2-CL   0.35(     7.1) + 0.65(     7.5) =    7.398   GM/BHP HR
                                                              CORRECTED NO2 =    8.030   GM/BHP HR
                                                                       BSFC =     .744   LB/BHP HR
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                     TABLE G-16. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-OP  TEST 103 RUN-1   DECEL MODULATOR        09-20-73      K =1.068     HUM =101.2  GR/LB
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                CONCENTRATION AS MEASURED   TOTAL    FUEL        CALCULATED GM/HR         WT.      WEIGHTED GM/HR                MAN.
MODE            HC      CO     CO2    NO    CARBON   CONS.       HC       CO      NO2    FACT.    HC       CO     NO2    HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE         384    .570    9.36    40   10.345    2132        85      237       3    .232    19.8      55      .6     0     16.9
2 16 HG         98    .220   11.56   382   11.886   10750        96      402     115    .077     7.4      31     8.9    23     16.0
3 10 HG         81    .290   12.47  1974   12.847   15649       107      714     596    .147    15.7     105    87.6    63     10.0
4 16 HG         66    .180   11.41   384   11.661   10750        66      335     119    .077     5.1      26     9.2    23     16.0
5 19 HG         66    .360   13.91   149   14.341    7212        36      366      32    .057     2.0      21     1.8     4     19.0
6 16 HG         59    .180   11.50   408   11.744   10750        58      333     124    .077     4.5      26     9.5    23     16.0
7  3 HG         65   1.790   13.28  1148   15.090   24903       116     5800     629    .113    13.1     655    71.1   107      3.0
8 16 HG         59    .170   11.52   420   11.748   10750        53      319     143    .077     4.1      25    11.0    23     16.0
9 C.T.          68    .310   13.92   151   14.303    6305        32      276      22    .143     4.6      39     3.1     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.7      34     7.1
1 IDLE         384    .570    9.36    40   10.345    2132        85      237       3    .232    19.8      55      .6     0     16.9
2 16 HG         51    .170   11.52   341   11.745   10750        50      319     109    .077     3.9      25     8.4    23     16.0
3 10 HG         53    .230   12.52  1992   12.807   15649        70      568     605    .147    10.3      83    88.9    63     10.0
4 16 HG         47    .170   11.54   405   11.761   10750        46      319     123    .077     3.6      24     9.5    23     16.0
5 19 HG         48    .380   13.98   203   14.412    7212        26      384      34    .057     1.5      22     1.9     4     19.0
6 16 HG         45    .160   11.58   417   11.784   10750        44      295     126    .077     3.4      23     9.7    23     16.0
7  3 HG         48   1.590   13.51  1177   15.102   24903        85     5130     644    .113     9.7     580    72.8   107      3.0
8 16 HG         42    .180   11.63   472   11.855   10750        41      330     142    .077     3.2      25    10.9    23     16.0
9 C.T.          56    .310   13.95   180   14.320    6305        27      276      22    .143     3.8      39     3.1     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.1      30     7.2
1 IDLE         522    .560    9.33    42   10.454    2132       115      231       3    .232    26.7      54      .7     0     16.9
2 16 HG         45    .170   11.57   380   11.784   10750        44      313     115    .077     3.4      24     8.9    23     16.0
3 10 HG         58    .240   12.57  1992   12.862   15649        63      590     603    .147     9.3      87    88.6    63     10.0
4 16 HG         41    .180   11.60   447   11.824   10750        40      331     135    .077     3.1      25    10.4    23     16.0
5 19 HG         41    .360   14.02   201   14.424    7212        22      364      33    .057     1.3      21     1.9     4     19.0
6 16 HG         39    .170   11.67   431   11.882   10750        38      311     129    .077     2.9      24    10.0    23     16.0
7  3 HG         42   1.360   13.57  1262   14.975   24903        75     4568     697    .113     8.5     516    78.7   107      3.0
8 16 HG         39    .160   11.61   489   11.812   10750        38      294     146    .077     3.0      23    11.3    23     16.0
9 C.T.          58    .310   13.95   148   14.323    6305        28      276      22    .143     3.9      39     3.1     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.2      28     7.4
1 IDLE         522    .560    9.33    42   10.454    2132       115      231       3    .232    26.7      54      .7     0     16.9
2 16 HG         43    .190   11.68   396   11.916   10750        42      346     119    .077     3.2      27     9.1    23     16.0
3 10 HG         46    .230   12.49  1511   12.770   15649        61      569     615    .147     8.9      84    90.4    63     10.0
4 16 HG         39    .180   11.65   478   11.872   10750        38      329     144    .077     2.9      25    11.1    23     16.0
5 19 HG         38    .340   14.07   189   14.451    7212        20      343      33    .057     1.2      20     1.9     4     19.0
6 16 HG         39    .170   11.72   445   11.931   10750        37      309     133    .077     2.8      24    10.2    23     16.0
7  3 HG         41   1.350   13.57  1227   14.964   24903        74     4538     678    .113     8.3     513    76.6   107      3.0
8 16 HG         36    .160   11.59   481   11.789   10750        35      295     146    .077     2.7      23    11.2    23     16.0
9 C.T.          51    .310   13.99   144   14.355    6305        24      275      21    .143     3.5      39     3.0     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.1      28     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     2.4      32     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     2.1      28     7.4
FOUR CYCLE COMPOSITE -                      HC- NDIR 0.35(     2.4) + 0.65(     2.1) =     2.208   GM/BHP HR
                                            CO- NDIR 0.35(    32.3) + 0.65(    28.2) =    29.632   GM/BHP HR
                                            NO2-NDIR 0.35(     7.1) + 0.65(     7.4) =     7.321   GM/BHP HR
                                                                 CORRECTED NO2 =     7.822   GM/BHP HR
                                                                          BSFC =      .785   LB/BHP HR
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                CONCENTRATION AS MEASURED   TOTAL    FUEL        CALCULATED GM/HR         WT.      WEIGHTED GM/HR                MAN.
MODE          HC-FID    CO     CO2  NO-CL   CARBON   CONS.       HC       CO      NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE        6660    .570    9.36    20   10.596    2132       134      232       1    .232    31.1      54      .3     0     16.9
2 16 HG        520    .220   11.56   395   11.832   10750        47      404     119    .077     3.6      31     9.2    23     16.0
3 10 HG        615    .290   12.47  1975   12.821   15649        75      715     598    .147    11.0     105    87.9    63     10.0
4 16 HG        281    .180   11.41   387   11.618   10750        26      336     119    .077     2.0      26     9.2    23     16.0
5 19 HG        390    .360   13.91   150   14.304    7212        17      367      25    .057     1.0      21     1.4     4     19.0
6 16 HG        243    .180   11.50   420   11.704   10750        22      334     128    .077     1.7      26     9.9    23     16.0
7  3 HG        612   1.790   13.28  1100   15.081   24903       101     5804     603    .113    11.4     656    68.1   107      3.0
8 16 HG        222    .170   11.52   475   11.712   10750        20      315     145    .077     1.6      24    11.1    23     16.0
9 C.T.         636    .310   13.92   137   14.294    6305        28      276      20    .143     4.0      39     2.9     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.3      34     7.0
1 IDLE        6660    .570    9.36    20   10.596    2132       134      232       1    .232    31.1      54      .3     0     16.9
2 16 HG        416    .170   11.52   350   11.732   10750        38      315     106    .077     2.9      24     8.2    23     16.0
3 10 HG        447    .230   12.52  1512   12.795   15649        55      560     619    .147     8.0      82    91.0    63     10.0
4 16 HG        222    .170   11.54   425   11.732   10750        20      315     129    .077     1.6      24    10.0    23     16.0
5 19 HG        268    .380   13.98   175   14.387    7212        13      385      29    .057      .8      22     1.7     4     19.0
6 16 HG        222    .160   11.58   425   11.762   10750        20      295     129    .077     1.6      23     9.9    23     16.0
7  3 HG        378   1.590   13.51  1150   15.088   24903        62     5134     630    .113     7.1     580    71.2   107      3.0
8 16 HG        166    .180   11.63   475   11.827   10750        15      330     143    .077     1.2      25    11.0    23     16.0
9 C.T.         445    .310   13.95   145   14.309    6305        22      274      21    .143     3.1      39     3.0     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.0      30     7.2
1 IDLE        6945    .560    9.33    25   10.589    2132       141      228       2    .232    32.6      53      .4     0     16.9
2 16 HG        340    .170   11.57   400   11.776   10750        33      313     121    .077     2.5      24     9.3    23     16.0
3 10 HG        405    .240   12.57  1512   12.850   15649        49      590     611    .147     7.2      87    89.9    63     10.0
4 16 HG        207    .180   11.60   462   11.801   10750        19      331     140    .077     1.5      26    10.8    23     16.0
5 19 HG        198    .360   14.02   175   14.400    7212        10      364      29    .057      .6      21     1.7     4     19.0
6 16 HG        189    .170   11.67   450   11.859   10750        17      311     138    .077     1.3      24    10.6    23     16.0
7  3 HG        298   1.360   13.57  1212   14.960   24903        50     4573     670    .113     5.6     517    75.7   107      3.0
8 16 HG        124    .160   11.61   487   11.782   10750        11      295     148    .077      .9      23    11.4    23     16.0
9 C.T.         396    .310   13.95   107   14.300    6305        17      276      16    .143     2.5      39     2.2     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     1.9      28     7.4
1 IDLE        6985    .560    9.33    25   10.589    2132       141      228       2    .232    32.6      53      .4     0     16.9
2 16 HG        374    .190   11.68   412   11.907   10750        34      346     123    .077     2.6      27     9.5    23     16.0
3 10 HG        405    .230   12.49  1537   12.760   15649        50      570     626    .147     7.3      84    92.0    63     10.0
4 16 HG        338    .180   11.65   487   11.864   10750        31      329     147    .077     2.4      25    11.3    23     16.0
5 19 HG        212    .340   14.07   175   14.431    7212        11      343      29    .057      .6      20     1.7     4     19.0
6 16 HG        194    .170   11.72   467   11.909   10750        18      310     140    .077     1.4      24    10.8    23     16.0
7  3 HG        288   1.350   13.57  1212   14.950   24903        50     4543     670    .113     5.6     513    75.7   107      3.0
8 16 HG        139    .160   11.59   492   11.764   10750        13      295     149    .077     1.0      23    11.5    23     16.0
9 C.T.         510    .310   13.99   132   14.351    6305        22      275      19    .143     3.2      39     2.8     0     20.0
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     2.0      28     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------     2.2      32     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------     1.9      28     7.4
FOUR CYCLE COMPOSITE -                      HC- FID  0.35(     2.2) + 0.65(     1.9) =     2.019   GM/BHP HR
                                            CO- NDIR 0.35(    32.3) + 0.65(    28.2) =    29.631   GM/BHP HR
                                            NO2-CL   0.35(     7.1) + 0.65(     7.4) =     7.300   GM/BHP HR
                                                                 CORRECTED NO2 =     7.800   GM/BHP HR
                                                                          BSFC =      .785   LB/BHP HR
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                    TABLE G-17. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-HP  TEST-109 RUN-1   TUNING 16 BTDC        09-20-73       H 81.092      HUM = 89.6  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR                MAN.
MODE              HC       CO     CO2     NO   CARBON    CONS.      HC      CO      NO2    FACT.    HC       CO     NO2     HP     VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE           1307    .420    7.51     69    9.342     1860      281     169       9    .232    65.2      39      .4      0    16.8
2 16 HG           174    .220   11.81    845   11.867    10342      163     475     249    .077    12.5      37    19.2     31    16.0
3 10 HG           127    .390   12.19   2456   12.707    16012      173     993    1027    .147    25.4     146   151.0     68    10.0
4 16 HG            96    .240   11.47   1025   11.814    10342       91     424     298    .077     7.0      33    22.9     31    16.0
5 19 HG            97    .440   13.70    376   14.296     7348       54     509      64    .057     3.1      29     3.7      8    19.0
6 16 HG            82    .250   11.42    948   11.754    10342       78     449     277    .077     6.0      34    21.3     31    16.0
7  3 HG            91   2.390   12.61   1567   14.919    25311      168    7211     889    .113    19.0     815   100.5    109     3.0
8 16 HG            70    .240   11.52   1063   11.846    10342       66     429     308    .077     5.1      33    23.7     31    16.0
9 C.T.           1371    .340    7.94     91    9.801     2091      308     160       6    .143    44.1      23      .9      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.8      47    10.7
1 IDLE           1307    .420    7.51     69    9.342     1860      281     169       9    .232    65.2      39      .4      0    16.8
2 16 HG           159    .300   11.47    834   11.962    10342      149     525     240    .077    11.5      40    18.5     31    16.0
3 10 HG           112    .390   12.28   2362   12.781    16012      152     984     984    .147    22.3     145   144.6     68    10.0
4 16 HG            90    .250   11.47    916   11.817    10342       85     442     266    .077     6.6      34    20.5     31    16.0
5 19 HG            81    .420   13.84    362   14.347     7348       46     435      60    .057     2.6      25     3.4      8    19.0
6 16 HG            78    .260   11.59    979   11.926    10342       73     438     282    .077     5.6      34    21.7     31    16.0
7  3 HG            85   2.060   12.79   1489   14.932    25311      156    7054     838    .113    17.6     797    94.7    109     3.0
8 16 HG            67    .240   11.50    887   11.812    10342       63     424     287    .077     4.9      33    22.1     31    16.0
9 C.T.           1281    .340    8.19     85    9.813     2091      295     141       6    .143    40.7      20      .9      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.5      36    10.1
1 IDLE           1474   1.040    9.26     48   12.542     1860      236     327       3    .232    54.8      76      .8      0    16.8
2 16 HG           155    .293   11.48    762   11.937    10342      145     508     219    .077    11.2      39    16.9     31    16.0
3 10 HG           117    .400   12.44   2365   12.866    16012      157    1006     977    .147    23.1     148   143.6     68    10.0
4 16 HG            92    .250   11.51    980   11.854    10342       87     440     284    .077     6.7      34    21.8     31    16.0
5 19 HG            86    .540   13.76    363   14.413     7348       47     577      61    .057     2.7      33     3.5      8    19.0
6 16 HG            76    .260   11.55    940   11.894    10342       73     457     271    .077     5.6      35    20.9     31    16.0
7  3 HG            85   2.100   12.77   1523   14.862    25311      156    6880     861    .113    17.7     777    97.3    109     3.0
8 16 HG            68    .230   11.51    969   11.813    10342       64     407     287    .077     5.0      31    22.1     31    16.0
9 C.T.           1244    .330    8.26     46    9.824     2091      276     137       6    .143    39.5      20      .8      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.2      37    10.2
1 IDLE           1474   1.040    9.26     48   12.542     1860      236     327       3    .232    54.8      76      .8      0    16.8
2 16 HG           160    .273   11.47    820   11.913    10342      150     473     236    .077    11.6      36    18.2     31    16.0
3 10 HG           117    .400   12.34   2371   12.866    16012      157    1006     980    .147    23.1     148   144.0     64    10.0
4 16 HG            95    .250   11.48   1019   11.833    10342       90     441     295    .077     6.9      34    22.7     31    16.0
5 19 HG            95    .560   13.76    364   14.403     7348       52     567      63    .057     3.0      32     3.6      8    19.0
6 16 HG            63    .260   11.54    967   11.890    10342       78     457     279    .077     6.0      35    21.5     31    16.0
7  3 HG            87   1.840   12.87   1626   14.804    25311      161    6493     923    .113    18.2     734   104.3    109     3.0
8 16 HG            70    .240   11.47    980   11.786    10342       66     425     286    .077     5.1      33    22.0     31    16.0
9 C.T.           1260    .330    8.17     93    9.861     2091      282     138       6    .143    40.3      20      .9      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.2      36    10.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------      5.6      37    10.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------      5.2      36    10.3
FOUR CYCLE COMPOSITE =
                                     HC- NDIR 0.35(    5.6) + 0.65(    5.2) =     5.354   GM/BHP HR
                                     CO- NDIR 0.35(   36.5) + 0.65(   36.3) =    36.377   GM/BHP HR
                                     NO2-NDIR 0.35(   10.4) + 0.65(   10.3) =    10.352   GM/BHP HR
                                                         CORRECTED NO2 =    10.784   GM/BHP HR
                                                                  BSFC =      .652   LB/BHP HR


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                 CONCENTRATION AS MEASURED     TOTAL     FUEL       CALCULATED GM/HR        WT.       WEIGHTED GM/HR                MAN.
MODE            HC-FID     CO     CO2  NO-CL   CARBON    CONS.      HC      CO      NO2    FACT.  HC-FID     CO  NO2-CL     HP     VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE          19320    .420    7.51     23    9.862     1860      364     160       1    .232    84.5      37      .3      0    16.8
2 16 HG           886    .270   11.41    787   11.769    10342       78     479     230    .077     6.0      37    17.7     31    16.0
3 10 HG          1395    .390   12.18   2375   12.710    16012      176     993     993    .147    25.8     146   146.0     68    10.0
4 16 HG           623    .240   11.47    975   11.772    10342       55     426     284    .077     4.2      33    21.9     31    16.0
5 19 HG           269    .430   13.70    325   14.266     7348       39     510      56    .057     2.2      29     3.2      8    19.0
6 16 HG           559    .250   11.42    913   11.725    10342       49     445     267    .077     3.8      34    20.6     31    16.0
7  3 HG          1207   2.090   12.63   1488   14.841    25311      206    7200     847    .113    23.3     814    95.2    109     3.0
8 16 HG           499    .240   11.52   1013   11.810    10342       44     425     295    .077     3.4      33    22.7     31    16.0
9 C.T.          21539    .340    7.94     15   10.474     2091      420     150       1    .143    60.0      21      .1      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      6.6      37    10.2
1 IDLE          19320    .420    7.51     23    9.862     1860      364     160       1    .232    84.5      37      .3      0    16.8
2 16 HG          1081    .300   11.47    735   11.878    10342       94     528     219    .077     7.2      41    16.9     31    16.0
3 10 HG           949    .390   12.28   2313   12.735    16012      119     991     966    .147    17.5     146   141.9     68    10.0
4 16 HG           596    .250   11.47    900   11.780    10342       52     443     262    .077     4.0      34    20.2     31    16.0
5 19 HG           523    .420   13.84    300   14.312     7348       27     436      51    .057     1.5      25     2.9      8    19.0
6 16 HG           540    .250   11.59    910   11.894    10342       47     439     271    .077     3.6      34    20.9     31    16.0
7  3 HG          1052   2.060   12.76   1425   14.906    25311      178    7047     801    .113    20.1     796    90.5    109     3.0
8 16 HG           428    .240   11.50    961   11.783    10342       38     426     281    .077     2.9      33    21.6     31    16.0
9 C.T.          20283    .340    8.19     20   10.658     2091      392     133       1    .143    56.1      19      .2      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      6.1      36     9.8
1 IDLE          18942   1.040    9.26     20   12.944     1860      274     319       1    .232    63.6      74      .2      0    16.8
2 16 HG           873    .290   11.48    735   11.857    10342       76     511     213    .077     5.9      39    16.4     31    16.0
3 10 HG          1006    .400   12.34   2347   12.841    16012      128    1008     968    .147    18.8     148   142.2     68    10.0
4 16 HG           582    .250   11.51    950   11.818    10342       51     442     276    .077     3.9      34    21.3     31    16.0
5 19 HG           608    .560   13.76    312   14.381     7348       31     574      53    .057     1.8      33     3.0      8    19.0
6 16 HG           512    .260   11.55    925   11.861    10342       45     454     268    .077     3.4      35    20.6     31    16.0
7  3 HG           995   2.090   12.77   1438   14.869    25311      169    6877     813    .113    19.1     777    91.9    109     3.0
8 16 HG           429    .230   11.51    925   11.783    10342       38     408     284    .077     2.9      31    21.9     31    16.0
9 C.T.          19860    .330    8.26     20   10.566     2091      384     129       1    .143    54.9      18      .2      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.9      37     9.9
1 IDLE          18942   1.030    9.26     20   12.844     1860      274     319       1    .232    63.6      74      .2      0    16.8
2 16 HG           920    .270   11.47    720   11.837    10342       85     477     223    .077     6.5      37    17.2     31    16.0
3 10 HG          1044    .400   12.34   2325   12.846    16012      131    1007     962    .147    19.2     148   141.4     68    10.0
4 16 HG           554    .250   11.48    940   11.785    10342       49     443     288    .077     3.7      34    22.2     31    16.0
5 19 HG           834    .550   13.76    325   14.383     7348       43     566      65    .057     2.4      32     3.1      8    19.0
6 16 HG           527    .260   11.54    950   11.853    10342       46     458     275    .077     3.5      35    21.2     31    16.0
7  3 HG           874   1.840   12.87   1563   14.808    25311      167    6491     887    .113    18.9     734   100.2    109     3.0
8 16 HG           416    .240   11.47    950   11.762    10342       37     437     278    .077     2.8      33    21.4     31    16.0
9 C.T.          19847    .340    8.17     25   10.480     2091      386     130       2    .143    55.2      19      .2      0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------      5.5      36    10.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------      6.4      36    10.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------      5.4      36    10.0
FOUR CYCLE COMPOSITE =
                                     HC- FID  0.35(    6.4) + 0.65(    5.4) =     5.758   GM/BHP HR
                                     CO- NDIR 0.35(   36.4) + 0.65(   36.2) =    36.288   GM/BHP HR
                                     NO2-CL   0.35(   10.0) + 0.65(   10.0) =     9.997   GM/BHP HR
                                                         CORRECTED NO2 =    10.406   GM/BHP HR
                                                                  BSFC =      .652   LB/BHP HR
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                   TABLE G-18. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP  TEST 104 RUN 2   TIMING 12 BTDC        04-20-73      K =1.004      HUM =104.3  GR/LB
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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE              HC      CO     CO2     NO    CARBON   CONS.       HC      CO     NO2    FACT.    HC       CO     NO2     HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE           672    .430    8.74     51    9.846    1996       146     175       3    .232    34.0      41      .8      0   16.6
2 16 MG          101    .220   11.29    520   11.619   10478        98     401     156    .077     7.6      31    12.0     28   16.0
3 10 MG           78    .360   12.31   1831   12.754   15967       105     910     761    .147    15.5     134   111.9     64   10.0
4 16 MG           59    .210   11.37    618   11.644   10478        57     382     185    .077     4.4      29    14.2     28   16.0
5 19 MG           61    .340   13.71    264   14.116    7167        33     344      45    .057     1.9      20     2.6      5   19.0
6 16 MG           51    .220   11.40    650   11.676   10478        48     399     194    .077     3.8      31    14.9     28   16.0
7  3 MG           56   1.840   13.02   1364   14.920   25175       102    6271     764    .113    11.5     709    86.3    107    3.0
8 16 MG           45    .210   11.44    706   11.694   10478        44     380     210    .077     3.4      29    16.2     28   16.0
9 C.T.          1257    .410    8.59     43   10.350    2268       293     181       6    .143    42.5      26      .9      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     4.1      35     8.4
1 IDLE           672    .430    8.74     51    9.846    1996       146     175       3    .232    34.0      41      .6      0   16.6
2 16 MG           72    .240   11.41    565   11.728   10478        68     433     168    .077     5.3      33    12.9     28   16.0
3 10 MG           59    .330   12.44   1920   12.834   15967        79     820     793    .147    11.7     122   116.6     64   10.0
4 16 MG           46    .220   11.43    653   11.700   10478        44     388     194    .077     3.4      31    15.0     28   16.0
5 19 MG           56    .410   13.77    281   14.240    7167        30     417      47    .057     1.7      24     2.7      5   19.0
6 16 MG           41    .210   11.48    666   11.734   10478        40     374     197    .077     3.0      29    15.2     28   16.0
7  3 MG           45   1.550   13.15   1392   14.784   25175        83    5468     787    .113     9.3     618    88.9    107    3.0
8 16 MG           37    .200   11.44    709   11.686   10478        36     362     211    .077     2.8      28    16.3     28   16.0
9 C.T.          1245    .390    8.74     41   10.435    2268       291     171       6    .143    41.6      24      .8      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     3.7      31     8.5
1 IDLE           619    .430   11.16     23   12.259    1996       105     294       4    .232    24.3      68      .9      0   16.6
2 16 MG           87    .230   11.43    560   11.754   10478        85     419     166    .077     6.4      32    12.8     28   16.0
3 10 MG           66    .290   12.29   1947   12.651   15967        90     734     816    .147    13.2     108   119.9     64   10.0
4 16 MG           51    .210   11.44    680   11.705   10478        49     380     202    .077     3.8      29    15.6     28   16.0
5 19 MG           46    .400   13.84    291   14.290    7167        25     405      48    .057     1.4      23     2.8      5   19.0
6 16 MG           45    .240   11.56    701   11.849   10478        43     420     206    .077     3.3      33    15.8     28   16.0
7  3 MG           48   1.540   13.19   1911   14.782   25175        88    5298     798    .113    10.0     599    90.2    107    3.0
8 16 MG           39    .200   11.46    728   11.702   10478        38     362     219    .077     2.9      28    16.9     28   16.0
9 C.T.          1149    .350    8.84     25   10.431    2268       270     154       5    .143    38.6      22      .6      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     3.4      31     9.1
1 IDLE           619    .430   11.16     23   12.259    1996       105     294       4    .232    24.3      68      .9      0   16.6
2 16 MG           83    .210   11.40    609   11.700   10478        80     380     181    .077     6.2      29    13.9     28   16.0
3 10 MG           62    .290   12.29   1939   12.642   15967        85     740     813    .147    12.4     109   119.5     64   10.0
4 16 MG           50    .220   11.44    679   11.714   10478        48     398     202    .077     3.7      31    15.5     28   16.0
5 19 MG           45    .480   13.76    289   14.289    7167        24     486      48    .057     1.4      28     2.7      5   19.0
6 16 MG           45    .220   11.48    641   11.749   10478        43     396     190    .077     3.3      31    14.6     28   16.0
7  3 MG           48   1.510   13.16   1933   14.722   25175        89    5216     814    .113    10.0     589    91.9    107    3.0
8 16 MG           38    .210   11.42    671   11.671   10478        37     381     200    .077     2.8      29    15.4     28   16.0
9 C.T.          1148    .370    8.75     25   10.360    2268       271     164       5    .143    38.8      23      .8      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     3.4      31     9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     3.9      33     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     3.4      31     9.1
FOUR CYCLE COMPOSITE =                  HC- NDIR 0.35(     3.9) + 0.65(     3.4) =     3.598   GM/BHP HR
                                        CO- NDIR 0.35(    33.0) + 0.65(    31.0) =    31.478   GM/BHP HR
                                        NO2-NDIR 0.35(     8.7) + 0.65(     9.1) =     8.954   GM/BHP HR
                                                             CORRECTED NO2 =     9.203   GM/BHP HR
                                                                      BSFC =      .699   LB/BHP HR


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                 CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE           HC-FID     CO     CO2  NO-CL    CARBON   CONS.       HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL    HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          9329    .430    8.74     26   10.103    1996       184     172       2    .232    42.8      40      .4      0   16.6
2 16 MG          680    .220   11.29    528   11.578   10478        62     402     159    .077     4.7      31    12.2     28   16.0
3 10 MG          866    .360   12.31   1825   12.757   15967       108     910     758    .147    15.9     134   111.5     64   10.0
4 16 MG          423    .210   11.37    620   11.622   10478        38     382     186    .077     2.9      29    14.3     28   16.0
5 19 MG          494    .340   13.71    225   14.099    7167        25     349      38    .057     1.4      20     2.2      5   19.0
6 16 MG          401    .220   11.40    657   11.660   10478        36     399     196    .077     2.8      31    15.1     28   16.0
7  3 MG          747   1.840   13.02   1325   14.935   25175       126    6265     742    .113    14.2     708    83.8    107    3.0
8 16 MG          332    .210   11.44    717   11.683   10478        30     380     213    .077     2.3      29    16.4     28   16.0
9 C.T.         19932    .410    8.59     40   10.993    2268       411     171       3    .143    58.8      24      .4      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     4.8      35     8.4
1 IDLE          9329    .430    8.74     26   10.103    1996       184     172       2    .232    42.8      40      .4      0   16.6
2 16 MG          582    .240   11.41    570   11.708   10478        52     434     169    .077     4.0      33    13.0     28   16.0
3 10 MG          671    .330   12.44   1912   12.837   15967        83     829     790    .147    12.3     122   116.1     64   10.0
4 16 MG          388    .220   11.43    675   11.688   10478        35     398     201    .077     2.7      31    15.5     28   16.0
5 19 MG          359    .410   13.77    185   14.216    7167        18     418      31    .057     1.0      24     1.8      5   19.0
6 16 MG          349    .210   11.48    662   11.725   10478        31     374     196    .077     2.4      29    15.1     28   16.0
7  3 MG          565   1.590   13.15   1362   14.797   25175        97    5464     769    .113    10.9     617    86.9    107    3.0
8 16 MG          249    .200   11.44    717   11.665   10478        22     363     214    .077     1.7      28    16.5     28   16.0
9 C.T.         18219    .390    8.74     40   10.952    2268       377     163       3    .143    54.0      23      .4      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     4.3      31     8.8
1 IDLE          8895    .430   11.16     36   12.979    1996       137     289       2    .232    31.7      67      .4      0   16.6
2 16 MG          567    .230   11.43    560   11.717   10478        51     415     166    .077     3.9      32    12.8     28   16.0
3 10 MG          655    .290   12.29   1937   12.646   15967        83     740     812    .147    12.2     109   119.4     64   10.0
4 16 MG          368    .210   11.44    687   11.687   10478        33     380     204    .077     2.5      29    15.7     28   16.0
5 19 MG          283    .400   13.84    250   14.268    7167        14     406      42    .057      .8      23     2.4      5   19.0
6 16 MG          341    .240   11.56    700   11.834   10478        30     429     206    .077     2.3      33    15.8     28   16.0
7  3 MG          553   1.540   13.19   1362   14.785   25175        94    5297     770    .113    10.6     599    87.0    107    3.0
8 16 MG          283    .200   11.46    765   11.688   10478        25     362     228    .077     2.0      28    17.6     28   16.0
9 C.T.         17193    .350    8.84     40   10.904    2268       357     147       3    .143    51.0      21      .4      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     3.9      31     9.0
1 IDLE          8895    .430   11.16     36   12.979    1996       137     289       2    .232    31.7      67      .4      0   16.6
2 16 MG          565    .210   11.40    595   11.666   10478        51     381     177    .077     3.9      29    13.7     28   16.0
3 10 MG          655    .290   12.28   1925   12.696   15967        84     740     807    .147    12.2     109   118.6     64   10.0
4 16 MG          360    .220   11.44    675   11.696   10478        32     398     201    .077     2.5      31    15.5     28   16.0
5 19 MG          345    .480   13.74    257   14.275    7167        17     487      43    .057     1.0      28     2.4      5   19.0
6 16 MG          332    .220   11.48    625   11.733   10478        30     393     185    .077     2.3      31    14.3     28   16.0
7  3 MG          559   1.510   13.16   1400   14.726   25175        96    5215     795    .113    10.8     589    89.8    107    3.0
8 16 MG          277    .210   11.42    675   11.658   10478        25     381     201    .077     1.9      29    15.5     28   16.0
9 C.T.         18000    .370    8.75     40   10.920    2268       374     155       3    .143    53.5      22      .4      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------     3.9      31     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     4.6      33     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     3.9      31     8.9
FOUR CYCLE COMPOSITE =                  HC- FID  0.35(     4.6) + 0.65(     3.9) =     4.140   GM/BHP HR
                                        CO- NDIR 0.35(    32.9) + 0.65(    30.9) =    31.604   GM/BHP HR
                                        NO2-CL   0.35(     8.6) + 0.65(     8.9) =     8.821   GM/BHP HR
                                                             CORRECTED NO2 =     9.558   GM/BHP HR
                                                                      BSFC =      .699   LB/BHP HR
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                         TABLE G-19,MASS EMISSIONS BY NINE-MODE FTP
ENGINE-7-UP TEST-104 RUN-3   TIMING 4 BTDC         09-20-73     K = 1.065     HUM = 99.3  GR/LB
-------------------------------------------------------------------------------------------------------------
            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE          HC     CO     CO2     NO   CARBON   CONS.      HC     CO     NO2   FACT.    HC       CO    NO2     HP    VAC.
-------------------------------------------------------------------------------------------------------------
1 IDLE       240   .430    9.85     58   10.639    2132      53    176      4    .232   12.3      41     .9      0   16.4
2 16 HG       54   .160   11.48    303   11.698   10297      51    294     88    .077    3.9      22    6.8     21   16.0
3 10 HG       46   .200   12.48   1147   12.730   16057      63    510    488    .147    9.2      75   71.8     59   10.0
4 16 HG       39   .150   11.44    347   11.652   10297      37    268    102    .077    2.8      21    7.9     21   16.0
5 19 HG       45   .200   13.90    188   14.149    7348      25    210     32    .057    1.4      12    1.8      1   19.0
6 16 HG       36   .220   11.60    366   11.859   10297      34    386    106    .077    2.6      30    8.1     21   16.0
7  3 HG       37   .980   13.84   1048   14.910   25402      68   3373    615    .113    7.7     381   69.5    103    3.0
8 16 HG       33   .240   11.54    384   11.816   10297      31    422    113    .077    2.4      33    8.7     21   16.0
9 C.T.       858   .320    9.20     74   10.497    2313     206    143      5    .143   29.5      20     .8      1   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  2.7      24    6.6
1 IDLE       240   .430    9.85     58   10.639    2132      52    176      4    .232   12.1      41     .9      0   16.4
2 16 HG       76   .140   11.54    315   11.762   10297      72    298     92    .077    5.5      23    7.1     21   16.0
3 10 HG       57   .170   12.64   1225   12.872   16057      77    438    507    .147   11.3      64   74.6     59   10.0
4 16 HG       48   .140   11.65    336   11.843   10297      46    246    109    .077    3.5      19    8.4     21   16.0
5 19 HG       49   .210   13.97    192   14.233    7348      27    219     33    .057    1.5      12    1.9      1   19.0
6 16 HG       44   .140   11.70    367   11.888   10297      41    245    103    .077    3.2      19    7.9     21   16.0
7  3 HG       42   .850   14.16   1149   15.055   25402      73   2843    640    .113    8.2     321   72.3    103    3.0
8 16 HG       39   .120   11.65    381   11.812   10297      37    211    110    .077    2.8      16    8.5     21   16.0
9 C.T.       769   .330    9.58     75   10.741    2313     179    144      5    .143   25.6      21     .7      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  2.8      20    6.8
1 IDLE       391   .430   10.06     59   10.878    2132      72    170      4    .232   16.7      39     .9      0   16.4
2 16 HG       81   .150   11.54    313   11.777   10297      76    266     91    .077    5.9      20    7.0     21   16.0
3 10 HG       61   .180   12.64   1214   12.926   16057      82    452    501    .147   12.0      66   73.6     59   10.0
4 16 HG       53   .150   11.62    320   11.843   10297      50    264    107    .077    3.9      20    8.2     21   16.0
5 19 HG       55   .260   14.06    194   14.389    7348      30    248     34    .057    1.7      14    1.9      1   19.0
6 16 HG       47   .150   11.71    395   11.911   10297      44    262    113    .077    3.4      20    8.7     21   16.0
7  3 HG       47   .910   14.17   1070   15.131   25402      85   3046    596    .113    9.6     344   67.4    103    3.0
8 16 HG       42   .130   11.67    427   11.845   10297      39    228    123    .077    3.0      18    9.5     21   16.0
9 C.T.       836   .360    9.63     78   10.893    2313     192    154      5    .143   27.4      22     .7      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  3.1      21    6.7
1 IDLE       391   .430   10.06     59   10.878    2132      72    170      4    .232   16.7      39     .9      0   16.4
2 16 HG       89   .160   11.64    354   11.796   10297      84    282    103    .077    6.5      22    7.9     21   16.0
3 10 HG       67   .180   12.62   1266   12.872   16057      90    456    524    .147   13.3      67   77.1     59   10.0
4 16 HG       59   .180   11.57    374   11.814   10297      54    317    108    .077    4.3      24    8.3     21   16.0
5 19 HG       56   .250   14.11    200   14.420    7348      31    257     34    .057    1.8      15    1.9      1   19.0
6 16 HG       52   .790   11.62    398   12.466   10297      46   1318    109    .077    3.6     101    8.4     21   16.0
7  3 HG       50   .730   14.11   1240   14.894   25402      92   2515    702    .113   10.4     284   79.3    103    3.0
8 16 HG       46   .120   11.56    405   11.730   10297      44    213    118    .077    3.4      16    9.1     21   16.0
9 C.T.       848   .340    9.58     76   10.836    2313     195    143      5    .143   28.0      21     .7      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  3.3      22    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------  2.7      22    6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------  3.2      22    6.9
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(   2.7) + 0.65(   3.2) =    3.022   GM/BHP HR
                                    CO- NDIR 0.35(  21.8) + 0.65(  21.6) =   21.631   GM/BHP HR
                                    NO2-NDIR 0.35(   6.7) + 0.65(   6.9) =    6.826   GM/BHP HR
                                                     CORRECTED NO2 =    7.267   GM/BHP HR
                                                              BSFC =     .791   LB/BHP HR


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            CONCENTRATION AS MEASURED       TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR               MAN.
MODE        HC-FID     CO     CO2  NO-CL   CARBON   CONS.      HC     CO     NO2   FACT.  HC-FID     CO  NO2-CL    HP    VAC.
-------------------------------------------------------------------------------------------------------------
1 IDLE       4380   .430    9.85     29   10.718    2132      87    173      2    .232   20.2      40     .4      0   16.4
2 16 HG       498   .160   11.48    400   11.690   10297      44    285     88    .077    3.4      22    6.8     21   16.0
3 10 HG       447   .200   12.48   1025   12.726   16057      56    510    429    .147    8.3      75   63.1     59   10.0
4 16 HG       207   .150   11.44    347   11.631   10297      18    268     99    .077    1.4      21    7.6     21   16.0
5 19 HG       155   .200   13.90    160   14.115    7348       8    210     26    .057     .5      12    1.5      1   19.0
6 16 HG       166   .220   11.60    350   11.837   10297      14    387    101    .077    1.1      30    7.8     21   16.0
7  3 HG       149   .980   13.84   1012   14.890   25402      34   3377    573    .113    3.8     382   64.8    103    3.0
8 16 HG       152   .240   11.54    400   11.796   10297      13    422    116    .077    1.0      33    8.9     21   16.0
9 C.T.      16103   .320    9.20     20   11.130    2313     335    134      1    .143   47.9      19     .2      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  3.3      26    6.3
1 IDLE       4380   .430    9.85     29   10.718    2132      87    173      2    .232   20.2      40     .4      0   16.4
2 16 HG       396   .140   11.54    315   11.715   10297      30    248     92    .077    2.3      19    7.1     21   16.0
3 10 HG       384   .170   12.64   1200   12.848   16057      44    428    498    .147    6.4      63   73.2     59   10.0
4 16 HG       207   .140   11.65    375   11.811   10297      18    247    109    .077    1.4      19    8.4     21   16.0
5 19 HG       155   .210   13.97    142   14.145    7348       8    220     28    .057     .5      13    1.6      1   19.0
6 16 HG       166   .140   11.70    350   11.857   10297      14    246    101    .077    1.1      19    7.8     21   16.0
7  3 HG       156   .850   14.16   1035   15.026   25402      26   2903    603    .113    3.0     328   68.2    103    3.0
8 16 HG       134   .120   11.65    335   11.784   10297      12    212    109    .077     .9      16    8.4     21   16.0
9 C.T.      14410   .330    9.58     20   11.351    2313     294    136      1    .143   42.0      19     .2      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  2.9      20    6.3
1 IDLE       5267   .430   10.08     31   11.037    2132     102    168      2    .232   23.6      39     .5      0   16.4
2 16 HG       318   .150   11.54    310   11.722   10297      28    266     90    .077    2.2      20    7.0     21   16.0
3 10 HG       293   .180   12.68   1200   12.884   16057      37    453    496    .147    5.4      67   73.0     59   10.0
4 16 HG       180   .150   11.63    350   11.798   10297      16    266    101    .077    1.2      20    7.8     21   16.0
5 19 HG       142   .240   14.05    163   14.304    7348       7    244     28    .057     .4      14    1.6      1   19.0
6 16 HG       152   .150   11.71    388   11.878   10297      13    263    112    .077    1.0      20    8.6     21   16.0
7  3 HG       156   .910   14.17   1025   15.096   25402      26   3093    573    .113    3.0     350   64.7    103    3.0
8 16 HG       139   .130   11.67    413   11.814   10297      12    229    120    .077     .9      18    9.2     21   16.0
9 C.T.      14420   .360    9.63     29   11.432    2313     292    147      1    .143   41.7      21     .2      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  3.0      21    6.4
1 IDLE       5267   .430   10.08     31   11.037    2132     102    168      2    .232   23.6      39     .5      0   16.4
2 16 HG       318   .150   11.54    345   11.732   10297      28    284    101    .077    2.1      22    7.7     21   16.0
3 10 HG       308   .180   12.62   1263   12.831   16057      38    455    525    .147    5.7      67   77.1     59   10.0
4 16 HG       180   .180   11.57    375   11.768   10297      16    318    109    .077    1.2      24    8.4     21   16.0
5 19 HG       142   .250   14.11    175   14.374    7348       7    254     30    .057     .4      15    1.7      1   19.0
6 16 HG       153   .790   11.62    388   12.425   10297      13   1322    107    .077    1.0     102    8.2     21   16.0
7  3 HG       142   .730   14.11   1200   14.854   25402      24   2522    681    .113    2.7     285   77.0    103    3.0
8 16 HG       124   .120   11.56    400   11.692   10297      11    213    117    .077     .8      16    9.0     21   16.0
9 C.T.      13975   .340    9.58     25   11.317    2313     286    140      2    .143   40.9      20     .3      0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------  2.9      22    7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------  3.1      22    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------  2.9      22    6.7
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(   3.1) + 0.65(   2.9) =    2.984   GM/BHP HR
                                    CO- NDIR 0.35(  21.7) + 0.65(  21.6) =   21.617   GM/BHP HR
                                    NO2-CL   0.35(   6.3) + 0.65(   6.7) =    6.567   GM/BHP HR
                                                     CORRECTED NO2 =    6.991   GM/BHP HR
                                                              BSFC =     .791   LB/BHP HR
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                      TABLE G-20. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-UP  TEST 104 RUN 4   TIMING TDC            03-20-73     # 31,060     HUM = 92.4  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR          WT.     WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2      NO    CARBON   CONS.      HC      CO      NO2      FACT.    HC       CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE         229    .200    9.98     68    10.427    2314      55      90       5       .232    12.7      21     1.2     0    15.0
2 16 HG         53    .100   11.48    244    11.637   10297      51     179      72       .077     3.9      14     5.5    16    16.0
3 10 HG         49    .130   12.64    940    12.818   15785      59     324     384       .147     8.6      48    56.5    54    10.0
4 16 HG         38    .090   11.60    262    11.731   10297      36     160      76       .077     2.8      12     5.9    16    16.0
5 19 HG         39    .190   14.06    174    14.292    7711      23     207      31       .057     1.3      12     1.8     0    19.0
6 16 HG         36    .090   11.64    283    11.769   10297      34     159      82       .077     2.6      12     6.3    16    16.0
7  3 HG         35    .790   14.29    968    15.118   25129      63    2653     534       .113     7.1     300    60.4    97     3.0
8 16 HG         33    .070   11.74    302    11.846   10297      31     123      87       .077     2.4       9     6.7    16    16.0
9 C.T.         287    .290    9.62     75    10.760    2409     190     131       6       .143    27.2      19      .8     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.9      18     6.0
1 IDLE         229    .200    9.98     68    10.427    2314      55      90       5       .232    12.7      21     1.2     0    15.0
2 16 HG         67    .080   11.62    256    11.782   10297      63     159      74       .077     4.9      12     5.7    16    16.0
3 10 HG         51    .110   12.68    968    12.845   15785      68     273     395       .147     9.9      40    58.1    54    10.0
4 16 HG         44    .080   11.62    274    11.748   10297      42     142      80       .077     3.2      11     6.1    16    16.0
5 19 HG         47    .140   14.15    174    14.341    7711      27     152      31       .057     1.6       9     1.8     0    19.0
6 16 HG         41    .100   11.72    295    11.864   10297      38     175      85       .077     3.0      13     6.5    16    16.0
7  3 HG         40    .690   14.36    980    15.093   25129      72    2321     542       .113     8.1     262    61.2    97     3.0
8 16 HG         34    .070   11.74    305    11.849   10297      34     123      88       .077     2.6       9     6.8    16    16.0
9 C.T.         679    .300    9.84     78    10.883    2409     162     134       6       .143    23.2      19      .9     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.9      17     6.2
1 IDLE         293    .240   10.21     75    10.772    2314      69     108       5       .232    16.0      25     1.2     0    15.0
2 16 HG         62    .080   11.50    261    11.647   10297      59     143      77       .077     4.5      11     5.9    16    16.0
3 10 HG         44    .120   12.72    929    12.893   15785      65     297     398       .147     9.5      44    58.5    54    10.0
4 16 HG         43    .080   11.65    286    11.776   10297      41     141      83       .077     3.1      11     6.4    16    16.0
5 19 HG         43    .140   14.21    183    14.446    7711      25     205      32       .057     1.4      12     1.8     0    19.0
6 16 HG         39    .090   11.68    291    11.812   10297      37     158      84       .077     2.8      12     6.5    16    16.0
7  3 HG         39    .690   14.39   1050    15.122   25129      70    2316     579       .113     7.9     262    65.5    97     3.0
8 16 HG         35    .080   11.68    309    11.798   10297      33     141      90       .077     2.5      11     6.9    16    16.0
9 C.T.         672    .300    9.47     78    10.896    2409     160     134       6       .143    22.9      19      .8     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       3.0      17     6.4
1 IDLE         298    .240   10.21     75    10.772    2314      69     109       5       .232    16.0      25     1.2     0    15.0
2 16 HG         65    .090   11.60    267    11.769   10297      61     159      83       .077     4.7      12     6.4    16    16.0
3 10 HG         60    .110   12.65   1023    12.914   15785      67     274     418       .147     9.8      40    61.5    54    10.0
4 16 HG         44    .090   11.65    287    11.788   10297      42     159      86       .077     3.2      12     6.6    16    16.0
5 19 HG         42    .160   14.16    175    14.365    7711      24     173      31       .057     1.4      10     1.8     0    19.0
6 16 HG         40    .090   11.64    300    11.773   10297      38     159      87       .077     2.9      12     6.7    16    16.0
7  3 HG         39    .620   14.38   1048    15.042   25129      70    2092     581       .113     8.0     236    65.7    97     3.0
8 16 HG         35    .080   11.72    325    11.838   10297      33     141      94       .077     2.5      11     7.2    16    16.0
9 C.T.         668    .290    9.84     74    10.851    2409     160     130       6       .143    22.9      19      .8     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       3.0      16     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       2.9      18     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       3.0      16     6.5
FOUR CYCLE COMPOSITE -                    HC= NDIR 0.35(     2.9) + 0.65(     3.0) =    2.964   GM/BHP HR
                                          CO= NDIR 0.35(    17.6) + 0.65(    16.3) =   16.754   GM/BHP HR
                                          NO2=NDIR 0.35(     6.1) + 0.65(     6.5) =    6.362   GM/BHP HR
                                                           CORRECTED NO2 =    6.746   GM/BHP HR
                                                                    BSFC =     .887   LB/BHP HR
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR          WT.     WEIGHTED GM/HR                MAN.
MODE           HC-FID   CO     CO2   NO-CL   CARBON   CONS.      HC      CO      NO2      FACT.   HC-FID     CO   NO2-CL   HP    VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE        3173    .200    9.98     49    10.497    2314      70      89       3       .232    16.2      21      .7     0    15.0
2 16 HG        221    .100   11.48    225    11.602   10297      20     179      66       .077     1.5      14     5.1    16    16.0
3 10 HG        252    .130   12.64    915    12.795   15785      31     324     375       .147     4.6      48    55.1    54    10.0
4 16 HG        121    .090   11.60    260    11.702   10297      11     160      76       .077      .8      12     5.8    16    16.0
5 19 HG        139    .190   14.06    135    14.264    7711       8     207      24       .057      .5      12     1.4     0    19.0
6 16 HG         99    .090   11.64    265    11.740   10297       9     159      77       .077      .7      12     5.9    16    16.0
7  3 HG         99    .790   14.29    905    15.090   25129      17    2653     500       .113     1.9     300    56.5    97     3.0
8 16 HG         78    .070   11.74    290    11.818   10297       7     123      84       .077      .5       9     6.5    16    16.0
9 C.T.       14192    .290    9.62     30    11.329    2409     301     129       2       .143    43.1      18      .3     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.9      18     5.7
1 IDLE        3173    .200    9.98     49    10.497    2314      70      89       3       .232    16.2      21      .7     0    15.0
2 16 HG        265    .080   11.62    245    11.736   10297      23     160      71       .077     1.8      12     5.4    16    16.0
3 10 HG        204    .110   12.68    990    12.810   15785      25     274     380       .147     3.7      40    55.9    54    10.0
4 16 HG        123    .080   11.62    270    11.712   10297      11     142      79       .077      .8      11     6.1    16    16.0
5 19 HG        145    .140   14.15    140    14.309    7711       8     152      25       .057      .5       9     1.4     0    19.0
6 16 HG        109    .100   11.72    285    11.830   10297       9     176      82       .077      .7      14     6.3    16    16.0
7  3 HG         98    .690   14.36    915    15.060   25129      16    2326     507       .113     1.8     263    57.3    97     3.0
8 16 HG         81    .070   11.74    295    11.818   10297       7     123      85       .077      .5       9     6.6    16    16.0
9 C.T.       11376    .300    9.85     30    11.288    2409     242     129       2       .143    34.6      18      .3     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.5      17     5.9
1 IDLE        2906    .240   10.21     40    10.791    2314      63     104       3       .232    14.5      24      .7     0    15.0
2 16 HG        210    .080   11.50    245    11.601   10297      19     143      72       .077     1.4      11     5.6    16    16.0
3 10 HG        187    .120   12.72    965    12.859   15785      23     298     393       .147     3.4      44    57.8    54    10.0
4 16 HG        118    .080   11.65    280    11.742   10297      10     142      82       .077      .8      11     6.3    16    16.0
5 19 HG        136    .190   14.21    140    14.414    7711       7     205      25       .057      .4      12     1.4     0    19.0
6 16 HG         94    .090   11.68    280    11.780   10297       9     159      81       .077      .7      12     6.2    16    16.0
7  3 HG        107    .690   14.39    960    15.091   25129      18    2321     531       .113     2.0     262    60.0    97     3.0
8 16 HG         88    .080   11.68    290    11.768   10297       7     141      84       .077      .6      11     6.5    16    16.0
9 C.T.       11816    .300    9.47     30    11.352    2409     250     128       2       .143    35.8      18      .3     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.5      17     6.0
1 IDLE        2906    .240   10.21     40    10.791    2314      63     104       3       .232    14.5      24      .7     0    15.0
2 16 HG        249    .090   11.60    270    11.715   10297      22     150      79       .077     1.7      12     6.1    16    16.0
3 10 HG        190    .110   12.65    960    12.779   15785      23     274     394       .147     3.5      40    57.9    54    10.0
4 16 HG        154    .090   11.65    290    11.755   10297      13     159      84       .077     1.0      12     6.5    16    16.0
5 19 HG        129    .160   14.16    140    14.333    7711       7     174      25       .057      .4      10     1.4     0    19.0
6 16 HG        105    .090   11.64    290    11.741   10297       9     159      84       .077      .7      12     6.5    16    16.0
7  3 HG         98    .620   14.38    985    15.010   25129      16    2092     547       .113     1.8     236    61.8    97     3.0
8 16 HG         81    .080   11.72    310    11.808   10297       7     141      90       .077      .5      11     6.9    16    16.0
9 C.T.       11593    .290    9.84     33    11.289    2409     247     126       2       .143    35.3      18      .3     0    21.8
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       2.5      16     6.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       2.7      18     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       2.5      16     6.1
FOUR CYCLE COMPOSITE -                    HC= FID  0.35(     2.7) + 0.65(     2.5) =    2.565   GM/BHP HR
                                          CO= NDIR 0.35(    17.6) + 0.65(    16.3) =   16.755   GM/BHP HR
                                          NO2=CL   0.35(     5.8) + 0.65(     6.1) =    5.995   GM/BHP HR
                                                           CORRECTED NO2 =    6.354   GM/BHP HR
                                                                    BSFC =     .887   LB/BHP HR
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                         TABLE G-21. ASS EMISSIONS BY NINE-MODE FID
ENGINE 7-HP  TEST 11  NO. 1   CARBURETOR JETS 64    10-11-73      K =1.024      HUM =104.0  GR/LB
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                CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR      WT.      WEIGHTED GM/HR                MAN.
MODE             HC      CO     CO2     NO    CARBON   CONS.       HC      CO     NO2    FACT.    HC       CO     NO2     HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE          131   1.140   10.19     82    11.471    1996       25     401       5    .232     5.7      93     1.1      0    16.9
2 16 MG         109    .200    9.48    140    10.292    9330      102     369      42    .077     7.9      28     3.3     13    16.0
3 10 MG          74    .230   11.16    209    11.492   14379      127     581     295    .147    18.7      85    43.3     50    10.0
4 16 MG          83    .190   10.10    163    10.380    9330       81     347      49    .077     6.2      27     3.8     13    16.0
5 19 MG         127    .210   12.32    111    12.667    6804       74     228      20    .057     4.2      13     1.1      0    19.0
6 16 MG          74    .200   10.24    191    10.515    9390       76     361      57    .077     5.9      28     4.4     13    16.0
7  3 MG          91    .410   13.21   1550    13.907   23134      146    2050     856    .113    16.4     232    96.7    103     3.0
8 16 MG          71    .190   10.06    170    10.327    9330       70     349      51    .077     5.4      27     4.0     13    16.0
9 C.T.         2092   1.230    7.66     97    11.585    1628      319     506       5    .143    45.7      72      .7      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.1      26     6.9
1 IDLE          131   1.190   10.19     82    11.471    1996       25     401       5    .232     5.7      93     1.1      0    16.9
2 16 MG          83    .190   10.07    154    10.350    9340       81     348      46    .077     6.3      27     3.6     13    16.0
3 10 MG          72    .190   11.32    295    11.478   14379       83     456     331    .147    14.3      67    48.6     50    10.0
4 16 MG          64    .150   10.25    196    10.469    9330       62     272      58    .077     4.8      21     4.5     13    16.0
5 19 MG         131    .170   12.31    102    12.321    6804       78     190      19    .057     4.5      11     1.1      0    19.0
6 16 MG          70    .150   10.16    184    10.396    9390       68     292      55    .077     5.3      22     4.2     13    16.0
7  3 MG          64    .450   13.18   1643    13.694   23134      117    1535     921    .113    13.2     173   104.1    103     3.0
8 16 MG          60    .170   10.15    197    10.385    9390       59     311      59    .077     4.5      24     4.6     13    16.0
9 C.T.         1854   1.680    7.81     98    11.498    1628      293     445       5    .143    41.9      71      .7      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.4      22     7.5
1 IDLE           93   1.210   10.66     83    11.960    1996       17     408       5    .232     3.9      95     1.1      0    16.9
2 16 MG          68    .140   10.16    168    10.423    9340       66     346      50    .077     5.1      27     3.9     13    16.0
3 10 MG          60    .170   11.16    268    11.395   14379       82     433     313    .147    12.0      64    46.1     50    10.0
4 16 MG          55    .190   10.25    197    10.449    9390       53     254      59    .077     4.1      20     4.5     13    16.0
5 19 MG         105    .210   12.34    105    12.663    6804       61     228      19    .057     3.5      13     1.1      0    19.0
6 16 MG          54    .170   10.26    201    10.488    9390       52     307      60    .077     4.0      24     4.6     13    16.0
7  3 MG          57    .500   13.18   1604    13.742   23134      104    1700     897    .113    11.7     192   101.3    103     3.0
8 16 MG          50    .180   10.26    231    10.494    9390       48     325      69    .077     3.7      25     5.3     13    16.0
9 C.T.         2031   1.740    7.48     95    11.463    1628      321     528       5    .143    45.8      76      .7      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.1      23     7.4
1 IDLE           43   1.210   10.66     82    11.960    1996       17     408       5    .232     3.9      95     1.1      0    16.9
2 16 MG          64    .160   10.15    168    10.385    9390       62     292      50    .077     5.2      22     3.9     13    16.0
3 10 MG          59    .190   11.22    778    11.474   14379       80     481     324    .147    11.7      71    47.6     50    10.0
4 16 MG          55    .150   10.15    187    10.358    9390       54     275      56    .077     4.1      21     4.3     13    16.0
5 19 MG          95    .190   12.17     92    12.453    6804       56     149      17    .057     3.2      11     1.0      0    19.0
6 16 MG          52    .120   10.10    171    10.276    9390       51     221      52    .077     4.0      17     4.0     13    16.0
7  3 MG          56    .430   13.15   1684    13.610   23134      103    1373     950    .113    11.6     155   107.4    103     3.0
8 16 MG          53    .140   10.13    206    10.327    9340       52     257      62    .077     4.0      20     4.8     13    16.0
9 C.T.         2092   1.740    7.66     97    11.545    1628      319     500       5    .143    45.6      73      .7      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.1      21     7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     4.7      24     7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     4.1      22     7.5
FOUR CYCLE COMPOSITE -                     HC= NDIR 0.35(     4.7) + 0.65(     4.1) =    4.324   GM/BHP HR
                                           CO= NDIR 0.35(    24.4) + 0.65(    22.3) =   23.041   GM/BHP HR
                                           NO2=NDIR 0.35(     7.2) + 0.65(     7.5) =    7.416   GM/BHP HR
                                                            CORRECTED NO2 =    7.065   GM/BHP HR
                                                                     BSFC =     .841   LB/BHP HR
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                CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR      WT.      WEIGHTED GM/HR                MAN.
MODE           HC-FID    CO     CO2  NO-CL    CARBON   CONS.       HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL    HP     VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE         1160   1.190   10.19     17    11.446    1996       20     402       1    .232     4.7      93      .2      0    16.9
2 16 MG         465    .200    9.48    100    10.227    9390       43     371      30    .077     3.3      29     2.4     13    16.0
3 10 MG         525    .230   11.16    660    11.443   14379       66     584     267    .147     9.7      86    39.3     50    10.0
4 16 MG         306    .190   10.10    130    10.321    9390       28     344      39    .077     2.1      27     3.0     13    16.0
5 19 MG        1148    .210   12.32     55    12.646    6804       62     228      10    .057     3.6      13      .6      0    19.0
6 16 MG         288    .200   10.23    153    10.459    9390       26     363      46    .077     2.0      28     3.6     13    16.0
7  3 MG         536    .410   13.21   1925    13.874   23134       89    2055     789    .113    10.1     232    89.1    103     3.0
8 16 MG         233    .190   10.36    200    10.273    9390       21     351      61    .077     1.6      27     4.7     13    16.0
9 C.T.        27821   1.230    7.66     21    12.162    1628      384     482       1    .143    54.9      69      .1      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.0      26     6.3
1 IDLE         1160   1.190   10.19     20    11.446    1996       20     402       1    .232     4.7      93      .3      0    16.9
2 16 MG         602    .190   10.07    120    10.320    9390       55     349      36    .077     4.2      27     2.6     13    16.0
3 10 MG         553    .180   11.32    710    11.455   14379       69     456     286    .147    10.2      67    41.5     50    10.0
4 16 MG         324    .140   10.25    160    10.432    9390       29     273      48    .077     2.2      21     3.7     13    16.0
5 19 MG        1029    .170   12.31     60    12.281    6804       57     190      11    .057     3.2      11      .6      0    19.0
6 16 MG         397    .160   10.16    145    10.359    9390       35     293      44    .077     2.7      23     3.4     13    16.0
7  3 MG         528    .450   13.18   1508    13.683   23134       80    1537     846    .113    10.1     174    95.7    103     3.0
8 16 MG         274    .170   10.15    175    10.347    9390       25     312      53    .077     1.9      24     4.1     13    16.0
9 C.T.        26977   1.680    7.81     19    12.188    1628      371     467       1    .143    53.1      67      .1      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.0      23     6.7
1 IDLE         1559   1.210   10.66     23    12.015    1996       26     406       1    .232     6.0      94      .4      0    16.9
2 16 MG         538    .140   10.16    136    10.404    9390       49     346      41    .077     3.7      27     3.1     13    16.0
3 10 MG         525    .170   11.16    630    11.382   14379       66     434     264    .147     9.7      64    38.8     50    10.0
4 16 MG         329    .190   10.25    165    10.423    9390       30     255      49    .077     2.3      20     3.8     13    16.0
5 19 MG        1269    .210   12.34     63    12.677    6804       68     228      11    .057     3.9      13      .6      0    19.0
6 16 MG         305    .170   10.26    160    10.460    9390       27     308      48    .077     2.1      24     3.7     13    16.0
7  3 MG         540    .500   13.18   1505    13.734   23134       91    1701     842    .113    10.3     192    95.1    103     3.0
8 16 MG         322    .180   10.26    200    10.472    9390       29     326      60    .077     2.2      25     4.6     13    16.0
9 C.T.        28664   1.290    7.48     23    12.136    1628      396     500       1    .143    56.7      71      .2      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.2      23     6.6
1 IDLE         1554   1.210   10.66     23    12.015    1996       26     406       1    .232     6.0      94      .3      0    16.9
2 16 MG         609    .160   10.15    137    10.371    9390       55     293      41    .077     4.2      23     3.2     13    16.0
3 10 MG         539    .190   11.22    713    11.464   14379       68     481     287    .147     9.9      71    42.2     50    10.0
4 16 MG         356    .150   10.15    155    10.336    9390       32     275      47    .077     2.5      21     3.6     13    16.0
5 19 MG        1119    .180   12.17     60    12.461    6804       61     149      11    .057     3.5      11      .6      0    19.0
6 16 MG         328    .120   10.10    140    10.253    9390       30     222      43    .077     2.3      17     3.3     13    16.0
7  3 MG         584    .400   13.15   1550    13.602   23134       89    1376     875    .113    10.1     155    98.9    103     3.0
8 16 MG         343    .140   10.13    175    10.304    9390       31     256      53    .077     2.4      20     4.1     13    16.0
9 C.T.        27824   1.740    7.66     21    12.172    1628      386     485       1    .143    54.8      69      .1      0    24.2
-----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     4.2      21     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     4.0      24     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     4.2      22     6.7
FOUR CYCLE COMPOSITE -                     HC= FID  0.35(     4.0) + 0.65(     4.2) =    4.155   GM/BHP HR
                                           CO= NDIR 0.35(    24.3) + 0.65(    22.1) =   22.893   GM/BHP HR
                                           NO2=CL   0.35(     6.5) + 0.65(     6.7) =    6.657   GM/BHP HR
                                                            CORRECTED NO2 =    7.150   GM/BHP HR
                                                                     BSFC =     .841   LB/BHP HR
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                    TABLE G-22.MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP  TEST 1-3 MOD 2   CARBURETOR JETS 65   10-11-73     K =1.070     HUM =102.2  GR/LB
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            CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR        WT.     WEIGHTED GM/HR            MAN.
MODE         HC     CO     CO2     NO   CARBON   CONS.     HC     CO    NO2    FACT.    HC     CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE       329  1.110   9.72     67   11.230   2268      71    453      4    .232   16.5    105    1.0     0   17.1
2 16 HG       52   .160  10.74    260   10.996  10387      53    305     82    .077    4.1     24    6.3    22   16.0
3 10 HG       49   .210  11.86   1165   12.143  15105      66    528    481    .147    9.7     78   70.7    58   10.0
4 16 HG       40   .160  10.85    329   11.044  10387      40    303    102    .077    3.1     23    7.9    22   16.0
5 19 HG       52   .140  12.80    138   13.086   7439      32    161     26    .057    1.8      9    1.5     1   19.0
6 16 HG       34   .150  10.91    312   11.131  10387      38    339     97    .077    2.9     26    7.5    22   16.0
7  3 HG       36   .810  13.49   1227   14.339  24132      65   2754    686    .113    7.4    311   77.5   104    3.0
8 16 HG       36   .150  10.85    345   11.039  10387      37    285    108    .077    2.8     22    8.3    22   16.0
9 C.T.      1744  1.580   7.80    105   11.293   2358     391    650      7    .143   55.9     93    1.0     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.8     25    6.7
1 IDLE       329  1.110   9.72     67   11.230   2268      71    453      4    .232   16.5    105    1.0     0   17.1
2 16 HG       12   .140  10.74    294   10.943  10387      12    364     93    .077     .9     28    7.1    22   16.0
3 10 HG       40   .240  11.96   1188   12.223  15105      53    574    487    .147    7.8     84   71.6    58   10.0
4 16 HG       36   .190  11.00    371   11.229  10387      36    355    114    .077    2.8     27    8.8    22   16.0
5 19 HG       44   .140  13.00    141   13.207   7439      21    159     26    .057    1.2      9    1.5     1   19.0
6 16 HG       46   .160  10.90    324   11.099  10387      36    302    102    .077    2.8     23    7.9    22   16.0
7  3 HG       37   .910  13.40   1257   14.340  24132      67   2753    702    .113    7.6    311   79.4   104    3.0
8 16 HG       34   .170  11.00    367   11.217  10387      34    318    113    .077    2.6     24    8.7    22   16.0
9 C.T.      2074  1.840   7.80    103   11.940   2358     442    742      7    .143   63.3    106    1.0     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.9     26    6.9
1 IDLE       142  1.110  10.14     78   11.443   2268      30    444      5    .232    7.1    103    1.2     0   17.1
2 16 HG       50   .170  10.84    287   11.054  10387      51    323     90    .077    3.9     25    6.9    22   16.0
3 10 HG       47   .210  11.86   1143   12.111  15105      63    529    473    .147    9.3     78   69.6    58   10.0
4 16 HG       40   .180  11.10    334   11.423  10387      40    334    114    .077    3.1     26    8.8    22   16.0
5 19 HG       44   .150  13.11    135   13.306   7439      27    169     25    .057    1.5     10    1.4     1   19.0
6 16 HG       39   .170  11.07    385   11.282  10387      39    316    118    .077    3.0     24    9.1    22   16.0
7  3 HG       39   .800  13.45   1221   14.292  24132      71   2729    684    .113    8.0    308   77.3   104    3.0
8 16 HG       35   .160  11.09    415   11.288  10387      35    297    127    .077    2.7     23    9.8    22   16.0
9 C.T.      1848  1.540   7.84     96   11.356   2358     414    646      7    .143   59.3     92     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.6     25    6.8
1 IDLE       142  1.110  10.14     78   11.443   2268      30    444      5    .232    7.1    103    1.2     0   17.1
2 16 HG       56   .190  11.05    311   11.299  10387      55    353     95    .077    4.2     27    7.3    22   16.0
3 10 HG       60   .220  11.46   1203   12.254  15105      67    548    492    .147    9.8     81   72.4    58   10.0
4 16 HG       49   .220  11.17    389   11.438  10387      43    404    120    .077    3.3     31    9.3    22   16.0
5 19 HG       46   .170  13.14    139   13.410   7439      28    191     26    .057    1.6     11    1.5     1   19.0
6 16 HG       49   .200  11.22    389   11.462  10387      38    366    117    .077    2.9     28    9.0    22   16.0
7  3 HG       41   .800  13.47   1283   14.314  24132      75   2724    718    .113    8.4    308   81.1   104    3.0
8 16 HG       36   .180  11.07    399   11.269  10387      36    335    122    .077    2.8     26    9.4    22   16.0
9 C.T.      2104  1.940   7.84     98   12.052   2358     445    767      6    .143   63.6    110     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.8     27    7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   3.9     26    6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   3.7     26    6.9
FOUR CYCLE COMPOSITE =                   HC- NDIR 0.35(    3.9) + 0.65(    3.7) =    3.769   GM/BHP HR
                                         CO- NDIR 0.35(   26.0) + 0.65(   26.0) =   26.013   GM/BHP HR
                                         NO2-NDIR 0.35(    6.8) + 0.65(    6.9) =    6.892   GM/BHP HR
                                                            CORRECTED NO2 =    7.378   GM/BHP HR
                                                                     BSFC =     .766   LB/BHP HR


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            CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR        WT.     WEIGHTED GM/HR            MAN.
MODE       HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC     CO    NO2    FACT.  HC-FID   CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE      3302  1.110   9.72     17   11.210   2268      67    454      1    .232   15.5    105     .3     0   17.1
2 16 HG      447   .160  10.34    230   10.985  10387      42    306     72    .077    3.3     24    5.6    22   16.0
3 10 HG      598   .210  11.84   1075   12.150  15105      74    527    444    .147   10.9     78   65.2    58   10.0
4 16 HG      317   .160  10.84    300   11.082  10387      30    303     93    .077    2.3     23    7.2    22   16.0
5 19 HG      548   .140  12.84     88   13.089   7439      33    161     17    .057    1.9      9     .9     1   19.0
6 16 HG      290   .180  10.91    275   11.119  10387      27    340     85    .077    2.1     26    6.6    22   16.0
7  3 HG      383   .810  13.49   1125   14.339  24132      64   2754    629    .113    7.3    311   71.0   104    3.0
8 16 HG      245   .150  10.85    300   11.023  10387      22    286     94    .077    1.7     22    7.2    22   16.0
9 C.T.     26041  1.540   7.68     20   12.029   2358     511    610      1    .143   73.1     87     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.4     25    6.1
1 IDLE      3302  1.110   9.72     17   11.210   2268      67    454      1    .232   15.5    105     .3     0   17.1
2 16 HG      537   .140  10.73    260   10.984  10387      51    363     82    .077    3.9     28    6.3    22   16.0
3 10 HG      626   .240  11.95   1088   12.243  15105      77    573    446    .147   11.4     84   65.5    58   10.0
4 16 HG      354   .190  11.00    325   11.226  10387      33    355    100    .077    2.6     27    7.7    22   16.0
5 19 HG      274   .140  13.03    100   13.197   7439      15    159     19    .057     .9      9    1.1     1   19.0
6 16 HG      317   .160  10.90    300   11.092  10387      30    303     93    .077    2.3     23    7.2    22   16.0
7  3 HG      404   .810  13.44   1150   14.440  24132      68   2753    642    .113    7.7    311   72.6   104    3.0
8 16 HG      255   .170  11.01    338   11.205  10387      24    318    104    .077    1.8     25    8.0    22   16.0
9 C.T.     29641  1.860   7.84     15   12.664   2358     552    700      1    .143   78.9    100     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.6     26    6.2
1 IDLE      2482  1.110  10.14     20   11.588   2268      58    434      1    .232   13.5    102     .3     0   17.1
2 16 HG      538   .170  10.83    245   11.054  10387      51    323     73    .077    3.9     25    5.6    22   16.0
3 10 HG      584   .210  11.86   1075   12.118  15105      73    529    445    .147   10.7     78   65.4    58   10.0
4 16 HG      408   .180  11.10    334   11.321  10387      37    334    103    .077    2.9     26    7.9    22   16.0
5 19 HG      464   .150  13.11    100   13.306   7439      26    169     19    .057    1.5     10    1.1     1   19.0
6 16 HG      290   .170  11.07    350   11.269  10387      27    317    107    .077    2.1     24    8.2    22   16.0
7  3 HG      439   .800  13.45   1150   14.294  24132      74   2728    645    .113    8.4    308   72.8   104    3.0
8 16 HG      269   .160  11.04    375   11.277  10387      25    298    115    .077    1.9     23    8.9    22   16.0
9 C.T.     25209  1.540   7.82     15   11.881   2358     500    617      1    .143   71.5     88     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.3     25    6.3
1 IDLE      2482  1.110  10.14     20   11.588   2268      58    434      1    .232   13.5    102     .3     0   17.1
2 16 HG      503   .190  11.05    280   11.240  10387      46    353     86    .077    3.6     27    6.6    22   16.0
3 10 HG      515   .220  11.46   1150   12.252  15105      64    548    471    .147    9.3     81   69.2    58   10.0
4 16 HG      346   .220  11.17    375   11.425  10387      31    404    113    .077    2.4     31    8.7    22   16.0
5 19 HG      387   .170  13.14    100   13.399   7439      21    191     18    .057    1.2     11    1.1     1   19.0
6 16 HG      408   .200  11.22    350   11.461  10387      37    366    105    .077    2.8     28    8.1    22   16.0
7  3 HG      466   .800  13.47   1175   14.317  24132      79   2724    658    .113    8.9    308   74.3   104    3.0
8 16 HG      276   .180  11.07    363   11.278  10387      25    335    111    .077    2.0     26    8.5    22   16.0
9 C.T.     29224  1.940   7.84     20   12.702   2358     543    727      1    .143   77.6    104     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.5     26    6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------   4.5     26    6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------   4.4     26    6.4
FOUR CYCLE COMPOSITE =                   HC- FID  0.35(    4.5) + 0.65(    4.4) =    4.419   GM/BHP HR
                                         CO- NDIR 0.35(   25.8) + 0.65(   25.8) =   25.792   GM/BHP HR
                                         NO2-CL   0.35(    6.1) + 0.65(    6.4) =    6.307   GM/BHP HR
                                                            CORRECTED NO2 =    6.751   GM/BHP HR
                                                                     BSFC =     .766   LB/BHP HR
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                 TABLE G-23. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-OP  TEST 113 RUN 3   CARBURETOR JETS 62     10-11-73       K =1.076      HUM =104.9  GR/LB
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                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR                 MAN.
MODE            HC     CO     CO2      NO      CARBON   CONS.     HC      CO     NO2   FACT.    HC       CO    NO2     HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          299   .360    9.44      52     10.233    2087     63     377      3    .232    14.6      87     .6      0    17.0
2 16 HG          65   .230   11.22     358     11.520   10297     63     415    106    .077     4.8      32    8.2     24    16.0
3 10 HG          54   .330   12.54    1233     12.968   16103     72     828    508    .147    10.6     122   74.7     61    10.0
4 16 HG          43   .360   11.54     422     11.956   10297     40     626    121    .077     3.1      48    9.3     24    16.0
5 19 HG          42   .280   13.76     183     14.085    8256     27     332     36    .057     1.5      19    2.0      8    19.0
6 16 HG          38   .230   11.41     389     11.651   10297     36     411    119    .077     2.8      32    9.2     24    16.0
7  3 HG          42  1.530   13.42     874     14.995   25129     76    5179    486    .113     8.6     585   54.9    104     3.0
8 16 HG          32   .250   11.44     420     11.775   10297     30     442    122    .077     2.3      34    9.4     24    16.0
9 C.T.         1813  1.450    7.60      90     11.408    1542    265     505      4    .143    37.8      72     .6      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    3.0      36    5.9
1 IDLE          299   .360    9.45      52     10.233    2087     63     377      3    .232    14.6      87     .6      0    17.0
2 16 HG          37   .250   11.37     368     11.660   10297     35     446    108    .077     2.7      34    8.3     24    16.0
3 10 HG          38   .340   12.57    1201     12.951   16103     51     854    496    .147     7.5     126   72.9     61    10.0
4 16 HG          29   .270   11.47     422     11.771   10297     27     477    129    .077     2.1      37    9.9     24    16.0
5 19 HG          30   .220   13.67     195     13.922    8256     19     264     38    .057     1.1      15    2.2      8    19.0
6 16 HG          29   .230   11.36     416     11.621   10297     28     412    122    .077     2.1      32    9.4     24    16.0
7  3 HG          34  1.370   13.51     904     14.917   25129     62    4662    506    .113     7.0     527   57.1    104     3.0
8 16 HG          25   .230   11.44     427     11.692   10297     24     409    125    .077     1.8      31    9.6     24    16.0
9 C.T.         1631  1.660    7.97     108     11.381    1542    238     454      5    .143    34.1      65     .7      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    2.6      33    6.0
1 IDLE          118   .930    9.84     103     10.947    2087     24     358      7    .232     5.6      83    1.5      0    17.0
2 16 HG          43   .250   11.45     396     11.746   10297     41     443    115    .077     3.1      34    8.9     24    16.0
3 10 HG          38   .300   12.55    1239     12.891   16103     51     757    519    .147     7.5     111   76.3     61    10.0
4 16 HG          27   .230   11.47     448     11.729   10297     26     408    131    .077     2.0      31   10.1     24    16.0
5 19 HG          30   .220   13.75     205     14.002    8256     19     262     40    .057     1.1      15    2.3      8    19.0
6 16 HG          28   .230   11.40     440     11.660   10297     27     410    129    .077     2.1      32    9.9     24    16.0
7  3 HG          29  1.190   13.44     972     14.711   25129     53    4106    551    .113     6.0     464   62.3    104     3.0
8 16 HG          22   .230   11.42     468     11.674   10297     21     410    134    .077     1.6      32   10.3     24    16.0
9 C.T.         1728  1.230    7.78     121     11.376    1542    253     424      5    .143    36.2      61     .8      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    2.3      30    6.4
1 IDLE          118   .930    9.89     103     10.947    2087     24     358      7    .232     5.6      83    1.5      0    17.0
2 16 HG          38   .260   11.41     419     11.711   10297     36     462    122    .077     2.8      36    9.4     24    16.0
3 10 HG          35   .330   12.59    1243     12.948   16103     47     829    513    .147     6.9     122   75.4     61    10.0
4 16 HG          26   .260   11.43     448     11.718   10297     25     462    131    .077     1.9      36   10.1     24    16.0
5 19 HG          24   .230   13.80     221     14.056    8256     15     273     43    .057      .9      16    2.5      8    19.0
6 16 HG          26   .240   11.42     469     11.688   10297     25     427    134    .077     1.9      33   10.3     24    16.0
7  3 HG          26  1.210   13.51     986     14.748   25129     48    4165    558    .113     5.4     471   63.0    104     3.0
8 16 HG          23   .210   11.39     486     11.626   10297     22     376    143    .077     1.7      29   11.0     24    16.0
9 C.T.         1630  1.590    8.14     132     11.490    1542    236     431      6    .143    33.8      62     .8      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    2.1      31    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    2.8      35    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    2.2      31    6.4
FOUR CYCLE COMPOSITE -
                                           HC- NDIR 0.35(     2.8) + 0.65(     2.2) =     2.411   GM/BHP HR
                                           CO- NDIR 0.35(    34.7) + 0.65(    30.7) =    32.132   GM/BHP HR
                                           NO2-NDIR 0.35(     5.9) + 0.65(     6.4) =     6.238   GM/BHP HR
                                                               CORRECTED NO2 =     6.711   GM/BHP HR
                                                                        BSFC =      .737   LB/BHP HR
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                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR                 MAN.
MODE           HC-FID   CO     CO2    NO-CL    CARBON   CONS.     HC      CO     NO2   FACT.  HC-FID     CO   NO2-CL   HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         4692   .360    9.46      15     10.879    2087     90     372      1    .232    20.9      86     .2      0    17.0
2 16 HG         553   .230   11.22     320     11.505   10297     49     414     95    .077     3.8      32    7.3     24    16.0
3 10 HG         546   .330   12.54    1135     12.965   16103     68     828    460    .147    10.0     122   67.6     61    10.0
4 16 HG         333   .360   11.55     388     11.943   10297     29     627    111    .077     2.2      48    8.5     24    16.0
5 19 HG         317   .280   13.76     138     14.072    8256     19     332     27    .057     1.1      19    1.5      8    19.0
6 16 HG         300   .230   11.39     350     11.640   10297     27     411    103    .077     2.0      32    7.9     24    16.0
7  3 HG         484  1.530   13.42     775     14.998   25129     81    5174    431    .113     9.2     585   48.7    104     3.0
8 16 HG         222   .250   11.44     375     11.762   10297     19     442    109    .077     1.5      34    8.4     24    16.0
9 C.T.        29578  1.850    7.60      10     12.408    1542    368     464      0    .143    52.6      66     .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    3.6      36    5.3
1 IDLE         4692   .360    9.45      15     10.879    2087     90     372      1    .232    20.9      86     .2      0    17.0
2 16 HG         664   .250   11.37     335     11.686   10297     59     446     98    .077     4.5      34    7.5     24    16.0
3 10 HG         532   .340   12.57    1100     12.963   16103     66     853    454    .147     9.7     125   66.7     61    10.0
4 16 HG         347   .270   11.47     388     11.775   10297     30     477    113    .077     2.3      37    8.7     24    16.0
5 19 HG         297   .220   13.67     145     13.920    8256     18     264     29    .057     1.0      15    1.6      8    19.0
6 16 HG         324   .230   11.36     375     11.622   10297     29     412    110    .077     2.2      32    8.5     24    16.0
7  3 HG         427  1.370   13.51     795     14.923   25129     72    4660    444    .113     8.1     527   50.2    104     3.0
8 16 HG         291   .230   11.44     375     11.699   10297     26     409    110    .077     2.0      31    8.5     24    16.0
9 C.T.        33924  1.660    7.97      12     13.028    1542    402     397      0    .143    57.5      57     .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    3.9      33    5.4
1 IDLE         2283   .930    9.84      23     11.098    2087     52     353      1    .232    12.1      82     .3      0    17.0
2 16 HG         516   .250   11.45     340     11.752   10297     45     442     99    .077     3.5      34    7.6     24    16.0
3 10 HG         548   .300   12.55    1130     12.905   16103     68     756    468    .147    10.1     111   68.8     61    10.0
4 16 HG         337   .230   11.47     393     11.734   10297     30     416    115    .077     2.3      31    8.8     24    16.0
5 19 HG         308   .220   13.75     138     14.001    8256     18     262     27    .057     1.0      15    1.5      8    19.0
6 16 HG         347   .230   11.40     380     11.665   10297     31     410    111    .077     2.4      32    8.6     24    16.0
7  3 HG         341  1.190   13.49     850     14.714   25129     58    4105    482    .113     6.6     464   54.5    104     3.0
8 16 HG         236   .230   11.42     395     11.674   10297     21     410    116    .077     1.6      32    8.9     24    16.0
9 C.T.        33945  1.230    7.28      14     12.904    1542    406     418      1    .143    58.0      60     .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    3.4      30    5.6
1 IDLE         2283   .930    9.89      23     11.098    2087     52     353      1    .232    12.1      82     .3      0    17.0
2 16 HG         576   .260   11.41     345     11.728   10297     51     461    101    .077     3.9      36    7.7     24    16.0
3 10 HG         592   .330   12.58    1130     12.963   16103     66     838    466    .147     9.7     122   68.5     61    10.0
4 16 HG         337   .260   11.43     380     11.724   10297     30     461    111    .077     2.3      36    8.5     24    16.0
5 19 HG         282   .240   13.80     145     14.058    8256     17     273     28    .057      .9      16    1.6      8    19.0
6 16 HG         317   .240   11.42     388     11.692   10297     28     427    113    .077     2.1      33    8.7     24    16.0
7  3 HG         342  1.210   13.51     863     14.756   25129     62    4162    488    .113     7.0     470   55.1    104     3.0
8 16 HG         267   .210   11.39     407     11.627   10297     24     376    120    .077     1.8      29    9.2     24    16.0
9 C.T.        33354  1.590    8.14      15     13.065    1542    394     379      1    .143    56.3      54     .1      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------    3.4      31    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------    3.7      34    5.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------    3.4      30    5.6
FOUR CYCLE COMPOSITE -
                                           HC- FID  0.35(     3.7) + 0.65(     3.4) =     3.500   GM/BHP HR
                                           CO- NDIR 0.35(    34.5) + 0.65(    30.4) =    31.820   GM/BHP HR
                                           NO2-CL   0.35(     5.3) + 0.65(     5.6) =     5.489   GM/BHP HR
                                                               CORRECTED NO2 =     5.905   GM/BHP HR
                                                                        BSFC =      .737   LB/BHP HR
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                      TABLE G-24. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP  TEST 113 RUN 4    CARBURETOR JETS LN    10-11-73       K =1.072      HUM =103.0  GR/LB
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MODE          CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR     WT.       WEIGHTED GM/HR           MAN.
               HC      CO     CO2     NO   CARBON   CONS.     HC     CO    NO2   FACT.    HC      CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        178    .990    9.71     80   10.892    2177     38    400      5   .232    8.8     93    1.2     0   16.5
2 16 HG        32    .260   11.72    411   12.015   10524     30    460    120   .077    2.3     35    9.2    25   16.0
3 10 HG        24    .340   12.79   1129   13.156   16511     33    862    470   .147    4.8    127   69.2    63   10.0
4 16 HG        17    .580   12.19    428   12.788   10524     15    944    103   .077    1.2     74    8.0    25   16.0
5 19 HG        17    .310   13.92    220   14.248    6940      9    305     36   .057     .5     17    2.0    18   19.0
6 16 HG        15    .250   11.70    450   11.966   10524     14    444    131   .077    1.1     34   10.1    25   16.0
7  3 HG        15   1.510   13.41    881   14.936   24313     26   4965    476   .113    3.0    561   53.8   104    3.0
8 16 HG        10    .230   11.82    465   12.061   10524      9    405    135   .077     .7     31   10.4    25   16.0
9 C.T.       1761   1.750    7.81    107   11.962    2268    376    698      7   .143   53.8    100    1.0     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.5     36    5.8
1 IDLE        178    .990    9.71     80   10.892    2177     38    400      5   .232    8.8     93    1.2     0   16.5
2 16 HG        34    .300   11.71    431   12.047   10524     32    529    125   .077    2.5     41    9.6    25   16.0
3 10 HG        24    .340   12.79   1176   13.156   16511     33    862    491   .147    4.8    127   72.0    63   10.0
4 16 HG        16    .360   11.98    430   12.357   10524     15    619    122   .077    1.1     48    9.4    25   16.0
5 19 HG        21    .530   13.94    230   14.493    6940     11    513     37   .057     .6     29    2.1    18   19.0
6 16 HG        16    .280   11.74    432   12.037   10524     15    494    125   .077    1.2     38    9.7    25   16.0
7  3 HG        16   1.430   13.49    877   14.937   24313     28   4702    474   .113    3.2    531   53.6   104    3.0
8 16 HG        12    .240   11.80    459   12.053   10524     11    423    133   .077     .8     33   10.2    25   16.0
9 C.T.       1879   1.700    7.82    108   11.549    2268    397    671      7   .143   56.7     96    1.0     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.7     35    5.6
1 IDLE        104    .900   10.13    108   11.142    2177     22    355      7   .232    5.1     82    1.6     0   16.5
2 16 HG        21    .250   11.66    413   11.933   10524     20    445    121   .077    1.5     34    9.3    25   16.0
3 10 HG        17    .340   12.82   1165   13.179   16511     23    860    485   .147    3.4    126   71.2    63   10.0
4 16 HG        13    .280   11.72    447   12.014   10524     12    495    130   .077     .9     38   10.0    25   16.0
5 19 HG        15    .420   13.98    223   14.416    6940      8    408     36   .057     .5     23    2.0    18   19.0
6 16 HG        12    .280   11.74    454   12.033   10524     11    495    132   .077     .8     38   10.2    25   16.0
7  3 HG        12   1.430   13.50    890   14.943   24313     21   4700    481   .113    2.4    531   54.3   104    3.0
8 16 HG         9    .240   11.81    510   12.060   10524      8    423    148   .077     .7     33   11.4    25   16.0
9 C.T.       1671   1.620    8.09    106   11.515    2268    355    644      7   .143   50.8     92    1.0     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.2     33    5.7
1 IDLE        104    .900   10.13    108   11.142    2177     22    355      7   .232    5.1     82    1.6     0   16.5
2 16 HG        29    .300   11.67    423   12.001   10524     27    531    123   .077    2.1     41    9.5    25   16.0
3 10 HG        22    .370   12.90   1153   13.194   16511     30    935    479   .147    4.4    137   70.4    63   10.0
4 16 HG        19    .300   11.78    466   12.101   10524     18    527    135   .077    1.4     41   10.4    25   16.0
5 19 HG        17    .460   13.99    241   14.468    6940      9    446     38   .057     .5     25    2.2    18   19.0
6 16 HG        14    .350   11.88    493   12.245   10524     13    608    141   .077    1.0     47   10.8    25   16.0
7  3 HG        14   1.920   13.50    855   15.485   24313     24   6248    446   .113    2.7    706   50.4   104    3.0
8 16 HG        12    .270   11.78    486   12.063   10524     11    476    141   .077     .8     37   10.8    25   16.0
9 C.T.       1722   1.630    7.98    118   11.470    2268    368    651      8   .143   52.6     93    1.1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     2.4     40    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     2.6     35    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     2.3     37    5.6
FOUR CYCLE COMPOSITE -
                                HC= NDIR 0.35(     2.6) + 0.65(     2.3) =    2.396   GM/BHP HR
                                CO= NDIR 0.35(    35.2) + 0.65(    36.9) =   36.277   GM/BHP HR
                               NO2=NDIR  0.35(     5.6) + 0.65(     5.6) =    5.620   GM/BHP HR
                                                     CORRECTED NO2 =    6.026   GM/BHP HR
                                                              BSFC =     .710   LB/BHP HR


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MODE          CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR     WT.       WEIGHTED GM/HR           MAN.
             HC-FID    CO     CO2  NO-CL   CARBON   CONS.     HC     CO    NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       3495    .990    9.71     12   11.049    2177     69    394      1   .232   16.0     91     .2     0   16.5
2 16 HG       464    .260   11.72    356   12.026   10524     41    460    103   .077    3.1     35    7.9    25   16.0
3 10 HG       455    .340   12.79   1012   13.176   16511     57    861    421   .147    8.4    127   61.9    63   10.0
4 16 HG       303    .580   12.19    375   12.800   10524     26    963    102   .077    1.9     74    7.9    25   16.0
5 19 HG       410    .310   13.92    150   14.271    6940     20    305     24   .057    1.1     17    1.4    18   19.0
6 16 HG       292    .250   11.70    395   11.970   10524     26    444    115   .077    2.0     34    8.9    25   16.0
7  3 HG       420   1.510   13.41    768   14.962   24313     68   4957    414   .113    7.7    560   46.8   104    3.0
8 16 HG       209    .230   11.82    413   12.071   10524     18    405    120   .077    1.4     31    9.2    25   16.0
9 C.T.      30476   1.750    7.81     15   12.608    2268    548    636      1   .143   78.4     91     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.0     36    4.6
1 IDLE       3495    .990    9.71     12   11.049    2177     69    394      1   .232   16.0     91     .2     0   16.5
2 16 HG       639    .300   11.71    370   12.074   10524     56    529    107   .077    4.3     41    8.2    25   16.0
3 10 HG       483    .340   12.79   1075   13.178   16511     61    860    447   .147    8.9    126   65.7    63   10.0
4 16 HG       321    .360   11.98    395   12.372   10524     27    619    112   .077    2.1     48    8.6    25   16.0
5 19 HG       624    .530   13.94    155   14.532    6940     30    511     25   .057    1.7     29    1.4    18   19.0
6 16 HG       292    .280   11.74    375   12.049   10524     26    494    109   .077    2.0     38    8.4    25   16.0
7  3 HG       391   1.430   13.49    763   14.959   24313     64   4695    412   .113    7.2    531   46.6   104    3.0
8 16 HG       211    .240   11.80    400   12.061   10524     18    423    116   .077    1.4     33    8.9    25   16.0
9 C.T.      37010   1.700    7.82     15   13.271    2268    632    597      1   .143   90.4     85     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.5     34    4.4
1 IDLE       1984    .900   10.13     22   11.228    2177     38    352      1   .232    8.8     82     .2     0   16.5
2 16 HG       522    .250   11.66    350   11.962   10524     46    444    102   .077    3.5     34    7.9    25   16.0
3 10 HG       483    .340   12.82   1067   13.208   16511     60    859    443   .147    8.8    126   65.1    63   10.0
4 16 HG       310    .280   11.72    392   12.031   10524     27    495    114   .077    2.1     38    8.8    25   16.0
5 19 HG       545    .420   13.98    150   14.455    6940     26    407     24   .057    1.5     23    1.4    18   19.0
6 16 HG       282    .280   11.74    390   12.048   10524     25    494    113   .077    1.9     38    8.7    25   16.0
7  3 HG       410   1.430   13.50    775   14.971   24313     67   4691    416   .113    7.6    530   47.0   104    3.0
8 16 HG       255    .240   11.81    413   12.075   10524     22    423    119   .077    1.7     33    9.2    25   16.0
9 C.T.      34438   1.620    8.09     15   13.154    2268    594    564      1   .143   84.9     81     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.0     33    5.0
1 IDLE       1984    .900   10.13     22   11.228    2177     38    352      1   .232    8.8     82     .2     0   16.5
2 16 HG       518    .300   11.67    350   12.022   10524     45    531    102   .077    3.5     41    7.9    25   16.0
3 10 HG       480    .370   12.90   1080   13.218   16511     60    934    448   .147    8.8    137   65.9    63   10.0
4 16 HG       296    .300   11.78    383   12.110   10524     26    527    111   .077    2.0     41    8.5    25   16.0
5 19 HG       497    .460   13.99    150   14.500    6940     24    445     24   .057    1.4     25    1.4    18   19.0
6 16 HG       273    .350   11.88    400   12.257   10524     23    607    114   .077    1.8     47    8.8    25   16.0
7  3 HG       343   1.920   13.50    763   15.504   24313     54   6240    397   .113    6.1    705   44.9   104    3.0
8 16 HG       206    .270   11.78    425   12.071   10524     18    476    123   .077    1.4     37    9.5    25   16.0
9 C.T.      33973   1.630    7.99     14   13.007    2268    592    574      1   .143   84.7     82     .1     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------     4.0     40    4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     4.2     35    4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     4.0     36    4.9
FOUR CYCLE COMPOSITE -
                                HC- FID  0.35(     4.2) + 0.65(     4.0) =    4.083   GM/BHP HR
                                CO- NDIR 0.35(    34.8) + 0.65(    36.4) =   35.833   GM/BHP HR
                                NO2-CL   0.35(     4.9) + 0.65(     4.9) =    4.919   GM/BHP HR
                                                     CORRECTED NO2 =    5.273   GM/BHP HR
                                                              BSFC =     .710   LB/BHP HR
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                    TABLE G-25, MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-HR  TEST 112 RUN 1                          10-11-73      K =1.079      HUM =106.5  GR/LB
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            CONCENTRATION AS MEASURED      TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE          HC     CO    CO2     NO      CARBON   CONS.     HC     CO     NO2     FACT.    HC        CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        395   .560   9.30     64     10.233    2313     84    256      5     .232    19.5       59    1.2     0    16.9
2 16 HG        56   .190  10.70    164     10.930   10161     56    263     51     .077     4.3       20    3.9    15    16.0
3 10 HG        65   .160  12.03    442     12.249   14833     59    391    178     .147     8.7       58   26.1    49    10.0
4 16 HG        36   .130  10.96    237     11.129   10161     35    240     63     .077     2.7       18    4.8    15    16.0
5 19 HG        34   .130  13.66    156     13.826    6668     17    127     25     .057     1.0        7    1.4     0    19.0
6 16 HG        34   .190  10.9     214     11.087   10161     34    259     65     .077     2.6       20    5.0    15    16.0
7  3 HG        34   .710  13.77   1061     14.487   23905     61   2367    591     .113     6.9      267   65.7   104     3.0
8 16 HG        42   .190  10.94    242     11.125   10161     41    258     73     .077     3.2       20    5.7    15    16.0
9 C.T.       1453   .120   8.0      92     10.451    2313    323    434      7     .143    46.2       62    1.0     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.0       23    4.9
1 IDLE        395   .560   9.31     64     10.233    2313     84    256      5     .232    19.5       59    1.2     0    16.9
2 16 HG        70   .110  10.96    188     11.096   10161     70    204     57     .077     5.4       16    4.4    15    16.0
3 10 HG        60   .120  12.1     464     12.409   14833     65    411    184     .147     9.5       60   27.1    49    10.0
4 16 HG        41   .150  11.0     226     11.194   10161     40    275     68     .077     3.1       21    5.2    15    16.0
5 19 HG        41   .041  13.7     161     13.806    6668     22     78     26     .057     1.3        4    1.5     0    19.0
6 16 HG        41   .121  11.1     222     11.214   10161     40    220     67     .077     3.1       17    5.1    15    16.0
7  3 HG        41   .741  13.7    1072     14.534   23905     73   2691    585     .113     8.2      293   66.1   104     3.0
8 16 HG        36   .111  10.94    238     11.049   10161     36    208     73     .077     2.8       16    5.6    15    16.0
9 C.T.       1317  1.070   9.0      88     10.472    2313    314    451      6     .143    44.9       64     .9     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.1       23    5.0
1 IDLE        442   .693   9.07     64     10.237    2313    108    315      5     .232    25.0       73    1.1     0    16.9
2 16 HG        71   .191  10.7     171     11.007   10161     71    280     52     .077     5.5       22    4.0    15    16.0
3 10 HG        61   .190  12.1     460     12.325   14833     66    460    183     .147     9.7       68   26.9    49    10.0
4 16 HG        41   .111  10.94    224     11.084   10161     41    204     68     .077     3.1       16    5.2    15    16.0
5 19 HG        50   .191  13.6     144     13.834    6668     26    136     24     .057     1.5        8    1.3     0    19.0
6 16 HG        40   .161  10.0     217     11.113   10161     39    246     66     .077     3.0       23    5.1    15    16.0
7  3 HG        39   .960  13.74   1022     14.642   23905     69   2836    554     .113     7.8      320   62.6   104     3.0
8 16 HG        35   .139  10.94    246     11.158   10161     34    234     71     .077     2.7       18    5.5    15    16.0
9 C.T.       1349  1.080   7.41     65     10.376    2313    322    464      6     .143    46.1       66     .9     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.4       26    4.8
1 IDLE        442   .693   9.17     64     10.237    2313    108    315      5     .232    25.0       73    1.1     0    16.9
2 16 HG        70   .141  10.1     190     11.116   10161     69    259     58     .077     5.3       20    4.4    15    16.0
3 10 HG        64   .170  12.1     442     12.370   14833     70    411    192     .147    10.3       60   28.2    49    10.0
4 16 HG        54   .140  11.0     227     11.208   10161     53    234     68     .077     3.3       18    5.3    15    16.0
5 19 HG        40   .120  13.64    144     13.853    6668     21    117     23     .057     1.2        7    1.3     0    19.0
6 16 HG        41   .130  11.13    223     11.194   10161     40    238     69     .077     3.1       18    5.3    15    16.0
7  3 HG        42   .900  13.75   1045     14.595   23905     74   2647    568     .113     8.4      299   64.2   104     3.0
8 16 HG        45   .140  10.92    229     11.089   10161     36    241     70     .077     2.7       19    5.4    15    16.0
9 C.T.       1293   .300   8.11     64     10.437    2313    298    438      6     .143    42.7       63     .9     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.3       24    4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.1       23    4.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.4       25    4.9
FOUR CYCLE COMPOSITE =
                                  HC= NDIR 0.35(    4.1) + 0.65(    4.4) =     4.277   GM/BHP HR
                                  CO= NDIR 0.35(   23.0) + 0.65(   25.3) =    24.456   GM/BHP HR
                                  NO2=NDIR 0.35(    4.9) + 0.65(    4.9) =     4.876   GM/BHP HR
                                                      CORRECTED NO2 =     5.259   GM/BHP HR
                                                               BSFC =      .866   LB/BHP HR


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            CONCENTRATION AS MEASURED      TOTAL    FUEL     CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE       HC-FID    CO    CO2   NO-CL     CARBON   CONS.     HC     CO     NO2     FACT.  HC-FID      CO  NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       4256   .560   9.1      21     10.286    2313     96    256      2     .232    22.2       59     .4     0    16.9
2 16 HG       523   .190  10.73    140     10.922   10161     49    263     43     .077     3.7       20    3.3    15    16.0
3 10 HG       473   .160  12.04    400     12.249   14833     57    391    161     .147     8.4       58   23.6    49    10.0
4 16 HG       304   .130  10.96    190     11.120   10161     28    240     58     .077     2.1       18    4.4    15    16.0
5 19 HG       292   .130  13.66    107     13.818    6668     14    127     17     .057      .8        7    1.0     0    19.0
6 16 HG       264   .140  10.91    190     11.076   10161     24    259     58     .077     1.9       20    4.5    15    16.0
7  3 HG       343   .710  13.74    993     14.484   23905     56   2367    544     .113     6.3      267   61.5   104     3.0
8 16 HG       165   .190  10.94    225     11.097   10161     15    258     68     .077     1.2       20    5.3    15    16.0
9 C.T.      21663   .420   8.0      17     11.156    2313    449    406      1     .143    64.2       58     .2     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.7       22    4.4
1 IDLE       4256   .560   9.10     21     10.286    2313     96    256      2     .232    22.2       59     .4     0    16.9
2 16 HG       561   .110  10.91    160     11.025   10161     51    205     49     .077     3.9       16    3.8    15    16.0
3 10 HG       501   .170  12.1     430     12.400   14833     60    411    171     .147     8.8       60   25.1    49    10.0
4 16 HG       317   .150  11.0     211     11.192   10161     29    275     63     .077     2.2       21    4.9    15    16.0
5 19 HG       269   .050  13.6     120     13.287    6668     13     78     19     .057      .7        4    1.1     0    19.0
6 16 HG       403   .120  11.1     205     11.200   10161     28    220     62     .077     2.1       17    4.8    15    16.0
7  3 HG       355   .740  13.7     993     14.525   23905     58   2592    543     .113     6.6      293   61.3   104     3.0
8 16 HG       244   .110  10.9     218     11.035   10161     23    206     67     .077     1.8       16    5.1    15    16.0
9 C.T.      20174  1.010   9.04     17     11.087    2313    425    426      1     .143    60.8       61     .2     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.6       23    4.5
1 IDLE       4792   .690   9.07     20     10.240    2313    108    315      1     .232    25.1       73     .3     0    16.9
2 16 HG       590   .191  10.72    150     10.990   10161     55    280     46     .077     4.3       22    3.5    15    16.0
3 10 HG       514   .191  12.11    435     12.372   14833     62    460    173     .147     9.1       68   25.5    49    10.0
4 16 HG       331   .110  10.91    200     11.072   10161     30    204     61     .077     2.3       16    4.7    15    16.0
5 19 HG       254   .190  13.64    120     13.806    6668     12    137     19     .057      .7        8    1.1     0    19.0
6 16 HG       276   .141  10.91    200     11.098   10161     26    296     61     .077     1.9       23    4.7    15    16.0
7  3 HG       355   .960  13.74    960     14.636   23905     59   2837    515     .113     6.6      321   58.2   104     3.0
8 16 HG       234   .140  10.93    211     11.143   10161     21    235     64     .077     1.6       18    5.0    15    16.0
9 C.T.      21214  1.030   7.11     18     11.052    2313    444    435      1     .143    63.5       62     .2     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.9       26    4.4
1 IDLE       4792   .690   9.07     20     10.240    2313    108    315      1     .232    25.1       73     .3     0    16.9
2 16 HG       613   .140  10.40    120     11.101   10161     56    259     52     .077     4.3       20    4.0    15    16.0
3 10 HG       514   .120  12.16    400     12.372   14833     62    412    159     .147     9.1       61   23.4    49    10.0
4 16 HG       331   .130  11.03    205     11.193   10161     30    238     62     .077     2.3       18    4.8    15    16.0
5 19 HG       274   .120  13.62    110     13.838    6668     13    117     18     .057      .8        7    1.0     0    19.0
6 16 HG       244   .130  11.02    205     11.178   10161     27    239     62     .077     2.1       18    4.8    15    16.0
7  3 HG       347   .910  13.75    950     14.685   23905     57   2649    517     .113     6.4      299   58.4   104     3.0
8 16 HG       263   .135  10.93    214     11.076   10161     24    241     65     .077     1.9       19    5.0    15    16.0
9 C.T.      19963   .880   9.11     14     11.085    2313    416    413      1     .143    59.5       59     .2     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     4.7       24    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     4.7       23    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     4.8       25    4.3
FOUR CYCLE COMPOSITE =
                                  HC= FID  0.35(    4.7) + 0.65(    4.8) =     4.758   GM/BHP HR
                                  CO= NDIR 0.35(   22.8) + 0.65(   25.1) =    24.301   GM/BHP HR
                                  NO2=CL   0.35(    4.5) + 0.65(    4.3) =     4.391   GM/BHP HR
                                                      CORRECTED NO2 =     4.736   GM/BHP HR
                                                               BSFC =      .866   LB/BHP HR
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                          TABLE G-26. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-HP  TEST 12 RUN 2  1 2 10                       10-11-73        K =1.053      HUM = 94.1  GR/LB
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               CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2     NO     CARBON    CONS.      HC      CO     NO2    FACT.   HC      CO    NO2    HP      VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE         544   .720    9.60     64    10.913     2268      123     302      5    .232   28.6     70    1.1     0    16.5
2 16 HG         76   .191   11.10    222    11.322     9662       70     241     64    .077    5.4     19    5.0    14    16.0
3 10 HG         67   .170   12.12    336    12.362    14243       83     396    128    .147   12.3     58   18.8    48    10.0
4 16 HG         56   .100   10.90    230    11.050     9662       53     176     67    .077    4.1     14    5.1    14    16.0
5 19 HG         54   .100   13.66    143    13.818     6759       29      98     24    .057    1.6      6    1.4     0    19.0
6 16 HG         53   .190   10.96    211    11.207     9662       49     331     60    .077    3.8     25    4.7    14    16.0
7  3 HG         52   .821   13.90    967    14.676    24041       92    2713    526    .113   10.4    307   59.4   103     3.0
8 16 HG         44   .127   11.14    245    11.218     9662       50     209     70    .077    3.9     16    5.4    14    16.0
9 C.T.        1399   .991    8.21     65    10.611     2087      297     354      6    .143   42.5     51     .8     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.9     24    4.4
1 IDLE         544   .720    9.60     69    10.913     2268      123     302      5    .232   28.6     70    1.1     0    16.5
2 16 HG         77   .150   10.89    183    11.123     9662       72     263     53    .077    5.6     20    4.1    14    16.0
3 10 HG         62   .240   12.19    330    12.497    14243       76     553    125    .147   11.2     81   18.4    48    10.0
4 16 HG         53   .180   11.10    234    11.317     9662       49     310     66    .077    3.8     24    5.1    14    16.0
5 19 HG         52   .120   13.60    159    13.426     6759       27     168     26    .057    1.6     10    1.5     0    19.0
6 16 HG         49   .200   11.03    190    11.283     9662       45     346     54    .077    3.5     27    4.2    14    16.0
7  3 HG         48   .840   13.86    964    14.752    24041       84    2768    516    .113    9.5    312   58.3   103     3.0
8 16 HG         43   .180   11.07    260    11.296     9662       40     311     74    .077    3.1     24    5.7    14    16.0
9 C.T.        1413   .330    8.15     74    10.610     2087      301     470      5    .143   43.0     53     .7     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.7     27    4.3
1 IDLE         256   .640    9.44     61    10.396     2268       60     282      4    .232   14.0     65    1.0     0    16.5
2 16 HG         76   .180   10.92    164    11.182     9662       71     314     47    .077    5.5     24    3.6    14    16.0
3 10 HG         54   .140   12.04    319    12.334    14243       74     443    119    .147   10.8     64   17.5    48    10.0
4 16 HG         50   .120   11.10    207    11.274     9662       46     208     59    .077    3.6     16    4.5    14    16.0
5 19 HG         47   .100   13.71    144    13.861     6759       25      98     27    .057    1.4      6    1.5     0    19.0
6 16 HG         48   .160   11.06    205    11.262     9662       44     277     58    .077    3.4     21    4.5    14    16.0
7  3 HG         40   .760   13.84   1020    14.642    24041       85    2488    556    .113    9.6    281   62.8   103     3.0
8 16 HG         42   .170   10.96    210    11.125     9662       39     211     63    .077    3.0     16    4.9    14    16.0
9 C.T.        1502  1.030    8.13     76    10.788     2087      315     403      5    .143   45.0     58     .7     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.2     24    4.4
1 IDLE         256   .640    9.44     61    10.396     2268       60     282      4    .232   14.0     65    1.0     0    16.5
2 16 HG         71   .130   10.98    182    11.086     9662       66     229     53    .077    5.1     18    4.1    14    16.0
3 10 HG         55   .160   12.04    337    12.309    14243       69     374    129    .147   10.1     55   19.0    48    10.0
4 16 HG         44   .130   11.02    209    11.202     9662       45     227     60    .077    3.4     17    4.6    14    16.0
5 19 HG         56   .140   13.64    140    13.840     6759       30     138     23    .057    1.7      8    1.3     0    19.0
6 16 HG         46   .150   11.02    199    11.220     9662       43     261     57    .077    3.3     20    4.4    14    16.0
7  3 HG         45   .730   13.77   1054    14.549    24041       80    2437    578    .113    9.1    275   65.3   103     3.0
8 16 HG         41   .150   10.99    228    11.184     9662       38     262     65    .077    2.9     20    5.0    14    16.0
9 C.T.        1462  1.160    8.10     77    10.839     2087      309     451      5    .143   43.5     65     .7     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.0     23    4.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------   4.8     26    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------   4.1     24    4.5
FOUR CYCLE COMPOSITE =
                                   HC= NDIR 0.35(    4.8) + 0.65(    4.1) =    4.338   GM/BHP HR
                                   CO= NDIR 0.35(   25.6) + 0.65(   23.7) =   24.340   GM/BHP HR
                                   NO2=NDIR 0.35(    4.3) + 0.65(    4.5) =    4.419   GM/BHP HR
                                                        CORRECTED NO2 =    4.648   GM/BHP HR
                                                                 BSFC =     .856   LB/BHP HR


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               CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL   HP      VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE        3396   .720    9.60     25    10.660     2268       72     309      2    .232   16.8     72     .4     0    16.5
2 16 HG        349   .140   11.10    170    11.275     9662       30     242     48    .077    2.3     19    3.7    14    16.0
3 10 HG        330   .170   12.12    290    12.323    14243       38     397    111    .147    5.6     58   16.4    48    10.0
4 16 HG        220   .100   10.90    195    11.022     9662       19     177     57    .077    1.5     14    4.4    14    16.0
5 19 HG        159   .100   13.66    105    13.776     6759        8      98     17    .057     .4      6    1.0     0    19.0
6 16 HG        200   .191   10.96    175    11.170     9662       17     332     50    .077    1.3     26    3.9    14    16.0
7  3 HG        255   .821   13.80    950    14.646    24041       42    2719    518    .113    4.7    307   58.5   103     3.0
8 16 HG        225   .127   11.04    214    11.183     9662       19     204     62    .077    1.5     16    4.8    14    16.0
9 C.T.       18431   .890    8.21     19    10.943     2087      352     343      1    .143   50.3     49     .2     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.6     24    4.0
1 IDLE        3396   .720    9.60     25    10.660     2268       72     309      2    .232   16.8     72     .4     0    16.5
2 16 HG        452   .150   10.89    153    11.085     9662       39     264     44    .077    3.0     20    3.4    14    16.0
3 10 HG        390   .240   12.19    295    12.469    14243       45     554    112    .147    6.6     81   16.4    48    10.0
4 16 HG        263   .180   11.04    200    11.286     9662       22     311     57    .077    1.7     24    4.4    14    16.0
5 19 HG        212   .170   13.60    110    13.791     6759       10     168     18    .057     .6     10    1.0     0    19.0
6 16 HG        244   .200   11.03    160    11.254     9662       21     347     46    .077    1.6     27    3.5    14    16.0
7  3 HG        242   .840   13.86    895    14.724    24041       40    2770    495    .113    4.5    313   54.8   103     3.0
8 16 HG        183   .180   11.07    230    11.269     9662       16     312     65    .077    1.2     24    5.0    14    16.0
9 C.T.       18211   .930    8.15     18    10.901     2087      349     360      1    .143   49.9     51     .2     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   3.7     27    3.9
1 IDLE        4374   .640    9.44     21    10.557     2268       94     278      1    .232   21.8     64     .3     0    16.5
2 16 HG        425   .180   10.92    140    11.148     9662       41     315     40    .077    3.2     24    3.1    14    16.0
3 10 HG        414   .190   12.04    270    12.312    14243       48     444    104    .147    7.1     65   15.2    48    10.0
4 16 HG        269   .120   11.10    180    11.247     9662       23     208     51    .077    1.8     16    4.0    14    16.0
5 19 HG        212   .100   13.71    125    13.841     6759       10      98     20    .057     .6      6    1.2     0    19.0
6 16 HG        244   .160   11.06    183    11.234     9662       21     278     52    .077    1.6     21    4.0    14    16.0
7  3 HG        266   .750   13.84    915    14.617    24041       44    2492    500    .113    4.9    282   56.5   103     3.0
8 16 HG        186   .127   10.96    180    11.099     9662       16     211     52    .077    1.2     16    4.0    14    16.0
9 C.T.       19525  1.031    8.13     18    11.113     2087      367     391      1    .143   52.4     56     .2     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.1     24    3.8
1 IDLE        4374   .640    9.44     21    10.557     2268       94     278      1    .232   21.8     64     .3     0    16.5
2 16 HG        478   .130   10.98    160    11.058     9662       42     229     46    .077    3.2     18    3.6    14    16.0
3 10 HG        432   .160   12.04    298    12.293    14243       50     374    115    .147    7.4     55   16.9    48    10.0
4 16 HG        280   .130   11.02    180    11.179     9662       25     227     52    .077    1.9     17    4.0    14    16.0
5 19 HG        240   .140   13.64    102    13.804     6759       12     138     17    .057     .7      8     .9     0    19.0
6 16 HG        263   .150   11.02    175    11.196     9662       23     261     50    .077    1.7     20    3.9    14    16.0
7  3 HG        240   .730   13.77    950    14.529    24041       48    2440    522    .113    5.4    276   59.0   103     3.0
8 16 HG        221   .150   10.99    200    11.162     9662       19     262     57    .077    1.5     20    4.4    14    16.0
9 C.T.       20193  1.160    8.10     19    11.279     2087      374     434      1    .143   53.4     62     .2     0    24.4
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------   4.2     23    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------   3.7     26    3.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------   4.1     24    3.9
FOUR CYCLE COMPOSITE =
                                   HC= FID  0.35(    3.7) + 0.65(    4.1) =    3.977   GM/BHP HR
                                   CO= NDIR 0.35(   25.7) + 0.65(   23.6) =   24.292   GM/BHP HR
                                   NO2=CL   0.35(    3.9) + 0.65(    3.9) =    3.926   GM/BHP HR
                                                        CORRECTED NO2 =    4.134   GM/BHP HR
                                                                 BSFC =     .856   LB/BHP HR
```

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                         TABLE G-27. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2=HP  TEST 112 RUN 3  FOR 15              10-11-73      K =1.052      HUM = 93.9  GR/LB
------------------------------------------------------------------------------------------------------------------------
                   CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE               HC      CO     CO2     NO     CARBON   CONS.       HC      CO     NO2   FACT.    HC      CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE            854    .140    9.11     78    10.251    2268       209     147      6   .232    47.9     34    1.3     0   16.7
2 16 HG            90    .130   11.30    196    11.237    9979        86     216     58   .077     6.6     17    4.4    15   16.0
3 10 HG            69    .100   11.66    169    11.835   14016        88     239     66   .147    13.0     35    9.8    33   10.0
4 16 HG            62    .110   10.96    243    11.027    9979        61     201     73   .077     4.7     15    5.6    15   16.0
5 19 HG            86    .100   13.59    159    13.250    6759        30      99     25   .057     1.7      6    1.4     0   19.0
6 16 HG            61    .100   10.86    225    11.015    9979        50     183     68   .077     3.8     14    5.2    15   16.0
7 3 HG             49    .500   13.76   1062    14.913   23542        86    1980    576   .113     9.8    224   65.1   100    3.0
8 16 HG            58    .200   11.62    243    10.878    9979        53     371     74   .077     4.1     29    5.7    15   16.0
9 C.T.           1410    .420    8.39     46     8.835    2177       313     188      6   .143    44.8     27     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     6.5     19    4.8
1 IDLE            863    .330    9.11     78    10.251    2268       209     147      6   .232    47.9     34    1.3     0   16.7
2 16 HG            67    .150   10.90    217    11.182    9979        65     254     65   .077     5.0     20    5.0    15   16.0
3 10 HG            58    .150   11.97    199    12.176   14016        65     349     74   .147     9.6     51   10.9    33   10.0
4 16 HG            49    .130   10.90    227    11.163    9979        47     235     67   .077     3.6     18    5.2    15   16.0
5 19 HG            52    .130   13.44    162    13.666    6759        28     130     27   .057     1.6      7    1.5     0   19.0
6 16 HG            44    .130   10.90    232    11.078    9979        43     237     81   .077     3.3     18    6.2    15   16.0
7 3 HG             43    .520   13.22    947    14.236   23542        77    1403    547   .113     8.7    159   61.8   100    3.0
8 16 HG            41    .190   10.72    268    11.074    9979        40     255     74   .077     3.1     20    5.7    15   16.0
9 C.T.           1422    .510    8.11     48    10.079    2177       310     231      6   .143    44.3     33     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     6.1     17    4.7
1 IDLE            415    .600    9.11     65    10.188    2268       100     265      4   .232    23.1     62     .9     0   16.7
2 16 HG            29    .130   11.30    201    11.251    9979        72     233     59   .077     5.5     18    4.6    15   16.0
3 10 HG            54    .140   11.30    167    11.853   14016        74     430     66   .147    10.9     63    9.6    33   10.0
4 16 HG            51    .100   10.93    241    11.198    9979        49     181     69   .077     3.8     14    5.3    15   16.0
5 19 HG            52    .160   13.64    162    13.806    6759        27     148     26   .057     1.6      8    1.5     0   19.0
6 16 HG            46    .140   10.91    238    11.199    9979        44     253     68   .077     3.3     19    5.2    15   16.0
7 3 HG             45    .420   13.22   1026    14.238   23542        80    1409    591   .113     9.1    159   66.7   100    3.0
8 16 HG            41    .190   10.90    277    11.176    9979        41     253     82   .077     3.2     19    6.3    15   16.0
9 C.T.           1299    .690    8.11     69    10.198    2177       298     298      6   .143    42.7     43     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     5.0     19    4.9
1 IDLE            415    .591    9.11     65    10.188    2268       100     265      4   .232    23.1     62     .9     0   16.7
2 16 HG            73    .200   11.30    123    11.319    9979        70     356     51   .077     5.4     27    3.9    15   16.0
3 10 HG            64    .170   11.70    162    11.928   14016        69     404     63   .147    10.1     59    9.3    33   10.0
4 16 HG            48    .140   10.30    205    11.152    9979        46     253     61   .077     3.6     19    4.7    15   16.0
5 19 HG            57    .160   13.44    143    13.662    6759        30     166     23   .057     1.7      9    1.3     0   19.0
6 16 HG            44    .140   10.37    223    11.156    9979        42     253     66   .077     3.2     19    5.1    15   16.0
7 3 HG             66    .540   13.66   1067    14.218   23542        79    1772    587   .113     8.9    200   66.3   100    3.0
8 16 HG            39    .140   10.64    264    11.002    9979        38     293     76   .077     2.9     23    5.9    15   16.0
9 C.T.           1271    .610    8.11     65    10.093    2177       296     266      6   .143    42.3     38     .9     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     4.8     22    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     6.3     18    4.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     4.9     21    4.8
FOUR CYCLE COMPOSITE =                    HC= NDIR 0.35(    6.3) + 0.65(    4.9) =    5.389   GM/BHP HR
                                          CO= NDIR 0.35(   18.2) + 0.65(   20.7) =   19.828   GM/BHP HR
                                          NO2=NDIR 0.35(    4.8) + 0.65(    4.8) =    4.772   GM/BHP HR
                                                              CORRECTED NO2 =    5.023   GM/BHP HR
                                                                       BSFC =     .954   LB/BHP HR


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                   CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR          MAN.
MODE             HC-FID    CO     CO2   NO-CL    CARBON   CONS.       HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL  HP   VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE           7654    .430    9.00     16    10.096    2268       172     150      1   .232    39.9     35     .3     0   16.7
2 16 HG           904    .120   11.02    130    11.190    9979        44     216     38   .077     3.4     17    3.0    15   16.0
3 10 HG           741    .100   11.66    140    11.748   14016        45     240     55   .147     6.7     35    8.1    33   10.0
4 16 HG           263    .110   10.75    145    10.987    9979        24     202     59   .077     1.9     16    4.5    15   16.0
5 19 HG           247    .100   13.59    100    13.715    6759        12     100     16   .057      .7      6     .9     0   19.0
6 16 HG           225    .100   10.86    180    10.982    9979        20     184     54   .077     1.6     14    4.2    15   16.0
7 3 HG            236    .500   13.76    930    14.304   23542        39    1984    505   .113     4.4    224   57.1   100    3.0
8 16 HG           224    .200   10.62    210    10.838    9979        17     372     64   .077     1.3     29    4.9    15   16.0
9 C.T.          17641    .420    9.00     17    10.204    2177       382     181      1   .143    54.6     26     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     5.5     19    4.0
1 IDLE           7654    .330    9.00     16    10.096    2268       172     150      1   .232    39.9     35     .3     0   16.7
2 16 HG           902    .140   11.44    160    11.077    9979        42     256     48   .077     3.2     20    3.7    15   16.0
3 10 HG           913    .160   11.12    160    12.161   14016        47     348     61   .147     7.0     51    9.0    33   10.0
4 16 HG           290    .140   10.77    180    11.139    9979        26     235     54   .077     2.0     18    4.1    15   16.0
5 19 HG           281    .130   13.48    105    13.638    6759        14     130     17   .057      .8      7    1.0     0   19.0
6 16 HG           248    .130   10.70    230    11.055    9979        22     237     66   .077     1.7     18    5.1    15   16.0
7 3 HG            261    .420   13.12    890    14.216   23542        43    1406    489   .113     4.9    159   55.3   100    3.0
8 16 HG           209    .140   10.40    210    11.050    9979        18     255     63   .077     1.4     20    4.8    15   16.0
9 C.T.          19907    .630    8.11     16    11.591    2177       393     221      1   .143    56.1     32     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     5.6     17    4.0
1 IDLE           5232    .590    9.15     18    10.263    2268       116     263      1   .232    26.8     61     .3     0   16.7
2 16 HG           530    .130   11.30    140    11.224    9979        48     233     38   .077     3.7     18    3.0    15   16.0
3 10 HG           471    .180   11.41    180    11.937   14016        56     431     55   .147     8.2     63    8.1    33   10.0
4 16 HG           331    .100   10.33    190    11.123    9979        30     181     57   .077     2.3     14    4.4    15   16.0
5 19 HG           138    .150   13.60    110    13.284    6759        17     149     18   .057      .9      8    1.0     0   19.0
6 16 HG           282    .140   10.90    190    11.128    9979        26     264     57   .077     1.9     20    4.4    15   16.0
7 3 HG            283    .480   13.12    960    14.210   23542        47    1406    528   .113     5.3    159   59.6   100    3.0
8 16 HG           214    .140   10.40    236    11.151    9979        19     253     70   .077     1.5     19    5.4    15   16.0
9 C.T.          13630    .640    8.11     18    10.660    2177       380     285      1   .143    54.3     41     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     5.0     19    4.1
1 IDLE           5232    .590    9.15     18    10.263    2268       116     263      1   .232    26.8     61     .3     0   16.7
2 16 HG           591    .200   11.08    140    11.248    9979        52     357     41   .077     4.0     27    3.2    15   16.0
3 10 HG           458    .120   11.70    155    11.916   14016        54     404     61   .147     7.9     59    8.9    33   10.0
4 16 HG           314    .140   10.96    180    11.131    9979        28     254     54   .077     2.2     20    4.1    15   16.0
5 19 HG           338    .160   13.44    100    13.636    6759        17     160     14   .057     1.0      9     .8     0   19.0
6 16 HG           276    .140   10.42    201    11.138    9979        25     253     59   .077     1.9     20    4.6    15   16.0
7 3 HG            389    .530   13.64    990    14.208   23542        64    1774    545   .113     7.3    200   61.5   100    3.0
8 16 HG           226    .140   10.80    230    10.983    9979        21     296     64   .077     1.6     23    4.9    15   16.0
9 C.T.          17939    .610    8.11     18    10.614    2177       371     255      1   .143    53.1     36     .2     0   24.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------     5.1     22    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------------     5.6     18    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------------     5.1     21    4.2
FOUR CYCLE COMPOSITE =                    HC= FID  0.35(    5.6) + 0.65(    5.1) =    5.274   GM/BHP HR
                                          CO= NDIR 0.35(   18.2) + 0.65(   20.6) =   19.774   GM/BHP HR
                                          NO2=CL   0.35(    4.0) + 0.65(    4.2) =    4.133   GM/BHP HR
                                                              CORRECTED NO2 =    4.350   GM/BHP HR
                                                                       BSFC =     .954   LB/BHP HR
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TABLE G-28. MASS EMISSIONS BY NINE-MODE FTP

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ENGINE 7-HP  TEST 115 RUN 1   0-CAT                    10-12-73     K =1.074     HUM =104.1  GR/LB
----------------------------------------------------------------------------------------------------------------------------
        CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
MODE      HC     CO    CO2     NO     CARBON   CONS.      HC     CO     NO2    FACT.    HC        CO    NO2     HP    VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE    29   .110  10.98     96    11.091    2087        6     42      6    .232    1.4       10    1.4      0    17.0
2 16 HG   19   .100  11.06    292    11.181   10070       19    182     69    .077    1.4       14    5.3     23    16.0
3 10 HG   29   .100  12.24   1551    12.416   15876       33    258    658    .147    4.9       38   96.8     61    10.0
4 16 HG   20   .100  11.06    484    11.182   10070       19    182    145    .077    1.5       14   11.1     23    16.0
5 19 HG   22   .090  13.52    356    13.634    6895       12 [illegible] 60    .057     .7        5    3.4      1    19.0
6 16 HG   19   .080  11.11    391    11.211   10070       18    155    119    .077    1.4       11    9.2     23    16.0
7  3 HG   22   .710  14.11    867    14.844   24721       40   1056    480    .113    4.5      119   54.2    114     3.0
8 16 HG   19   .090  10.35    408    10.961   10070       19    167    124    .077    1.5       13    9.5     23    16.0
9 C.T.    71   .120  11.65     98    11.827    2177       19     37      6    .143    2.0        5     .9      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7        8    6.9
1 IDLE    29   .110  10.98     96    11.091    2087        6     42      6    .232    1.4       10    1.4      0    17.0
2 16 HG   20   .050  11.09    298    11.112   10070       20     92     87    .077    1.5        7    6.7     23    16.0
3 10 HG   25   .080  12.41   1350    12.517   15876       36    207    573    .147    5.3       30   84.2     61    10.0
4 16 HG   19   .050  11.10    441    11.201   10070       18    144    132    .077    1.4       11   10.1     23    16.0
5 19 HG   22   .080  13.30    267    13.404    6895       12     81     44    .057     .7        5    2.5      1    19.0
6 16 HG   19   .070  11.15    414    11.241   10070       18    127    121    .077    1.4       10    9.3     23    16.0
7  3 HG   24   .120  14.42    828    14.566   24721       44    584    467    .113    5.0       66   52.7    114     3.0
8 16 HG   20   .080  10.90    445    11.002   10070       20    148    135    .077    1.5       11   10.4     23    16.0
9 C.T.    49   .090  11.66     95    11.819    2177       13     33      6    .143    1.8        5     .8      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7        6    6.4
1 IDLE    31   .090  10.99     82    11.113    2087        6     34      5    .232    1.4        8    1.2      0    17.0
2 16 HG   21   .090  11.08    342    11.193   10070       20    164    102    .077    1.6       13    7.9     23    16.0
3 10 HG   26   .090  12.35   1411    12.468   15876       36    231    596    .147    5.3       34   87.7     61    10.0
4 16 HG   20   .090  11.15    442    11.252   10070       19    145    137    .077    1.5       11   10.6     23    16.0
5 19 HG   22   .090  13.74    261    13.854    6895       12     90     43    .057     .7        5    2.5      1    19.0
6 16 HG   20   .080  11.16    402    11.272   10070       19    162    119    .077    1.5       13    9.2     23    16.0
7  3 HG   24   .140  14.30    903    14.466   24721       44    483    512    .113    5.0       55   57.9    104     3.0
8 16 HG   19   .100  10.74    395    10.861   10070       19    187    122    .077    1.5       14    9.4     23    16.0
9 C.T.    83   .130  11.83     95    12.050    2177       16     47      6    .143    2.3        7     .8      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7        6    6.7
1 IDLE    31   .090  10.99     82    11.113    2087        6     34      5    .232    1.5        8    1.2      0    17.0
2 16 HG   21   .060  11.07    338    11.173   10070       20    146    101    .077    1.6       11    7.8     23    16.0
3 10 HG   26   .070  12.26   1394    12.348   15876       36    182    595    .147    5.3       27   87.5     61    10.0
4 16 HG   20   .070  11.13    449    11.222   10070       19    127    134    .077    1.5       10   10.3     23    16.0
5 19 HG   24   .090  13.71    250    13.816    6895       13     81     41    .057     .7        5    2.4      1    19.0
6 16 HG   22   .070  11.13    411    11.224   10070       21    127    122    .077    1.6       10    9.4     23    16.0
7  3 HG   25   .100  14.26    992    14.377   24721       46    347    566    .113    5.2       39   64.0    104     3.0
8 16 HG   19   .070  10.97    481    11.061   10070       19    129    145    .077    1.4       10   11.2     23    16.0
9 C.T.    58   .080  11.73    104    11.873    2177       11     30      6    .143    1.6        4     .9      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7        4    7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .7        7    6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .7        5    6.8
FOUR CYCLE COMPOSITE -
                                 HC- NDIR 0.35(     .7) + 0.65(     .7) =     .727   GM/BHP HR
                                 CO- NDIR 0.35(    6.9) + 0.65(    5.1) =    5.710   GM/BHP HR
                                 NO2--NDIR 0.35(   6.6) + 0.65(    6.8) =    6.776   GM/BHP HR
                                                   CORRECTED NO2 =    7.278   GM/BHP HR
                                                            BSFC =     .745   LB/BHP HR
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        CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR              MAN.
MODE    HC-FID   CO    CO2   NO-CL    CARBON   CONS.      HC     CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE   245   .110  10.98     50    11.084    2087        5     42      3    .232    1.1       10     .7      0    17.0
2 16 HG   66   .100  11.06    200    11.169   10070        8    182     60    .077     .6       14    4.6     23    16.0
3 10 HG  120   .100  12.29   1512    12.402   15876       15    258    643    .147    2.3       38   94.5     61    10.0
4 16 HG   64   .100  11.06    450    11.166   10070        6    182    136    .077     .4       14   10.4     23    16.0
5 19 HG   61   .080  13.52    300    13.615    6895        3     92     50    .057     .1        5    2.9      1    19.0
6 16 HG   58   .080  11.11    350    11.196   10070        5    145    105    .077     .4       11    8.1     23    16.0
7  3 HG   94   .710  14.42    800    14.650   24721       16   1057    448    .113    1.9      119   50.6    104     3.0
8 16 HG   50   .090  10.85    398    10.945   10070        5    167    119    .077     .4       13    9.1     23    16.0
9 C.T.   520   .100  11.66     45    11.802    2177       10     37      3    .143    1.4        5     .4      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .3        8    6.5
1 IDLE   245   .110  10.96     50    11.084    2087        5     42      3    .232    1.1       10     .7      0    17.0
2 16 HG   56   .060  11.04    270    11.096   10070        5     92     81    .077     .4        7    6.3     23    16.0
3 10 HG   94   .080  12.31   1350    12.400   15876       13    207    574    .147    1.9       30   84.4     61    10.0
4 16 HG   67   .080  11.10    400    11.187   10070        6    145    120    .077     .5       11    9.2     23    16.0
5 19 HG   46   .080  13.20    200    13.285    6895        2     81     33    .057     .1        5    1.9      1    19.0
6 16 HG   53   .070  11.15    380    11.225   10070        5    127    113    .077     .4       10    8.7     23    16.0
7  3 HG   85   .120  14.37    825    14.549   24721       14    584    465    .113    1.6       66   52.6    104     3.0
8 16 HG   50   .080  10.90    400    10.985   10070        5    148    122    .077     .3       11    9.4     23    16.0
9 C.T.   450   .090  11.66     20    11.795    2177        8     34      1    .143    1.2        5     .2      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .3        6    6.2
1 IDLE   144   .090  10.99     25    11.095    2087        3     34      2    .232     .6        8     .4      0    17.0
2 16 HG  119   .090  11.08    300    11.182   10070       11    164     90    .077     .8       13    6.9     23    16.0
3 10 HG   80   .090  12.36   1350    12.448   15876       10    232    572    .147    1.5       34   84.1     61    10.0
4 16 HG   43   .080  11.15    420    11.234   10070        4    145    125    .077     .3       11    9.6     23    16.0
5 19 HG   34   .050  13.74    190    13.833    6895        2     91     31    .057     .1        5    1.8      1    19.0
6 16 HG   41   .090  11.16    365    11.254   10070        4    163    108    .077     .3       13    8.3     23    16.0
7  3 HG   66   .140  14.30    838    14.447   24721       11    484    476    .113    1.3       55   53.8    104     3.0
8 16 HG   40   .100  10.74    440    10.844   10070        4    188    136    .077     .3       14   10.4     23    16.0
9 C.T.   444   .130  11.83     35    12.004    2177        8     48      2    .143    1.2        7     .3      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .2        6    6.3
1 IDLE   148   .080  10.99     25    11.095    2087        3     34      2    .232     .6        8     .4      0    17.0
2 16 HG   46   .060  11.07    290    11.155   10070        4    146     87    .077     .3       11    6.7     23    16.0
3 10 HG   77   .070  12.25   1339    12.328   15876       10    182    572    .147    1.5       27   84.1     61    10.0
4 16 HG   38   .070  11.13    420    11.204   10070        3    127    125    .077     .3       10    9.7     23    16.0
5 19 HG   26   .080  13.21    200    13.293    6895        1     81     33    .057     .1        5    1.9      1    19.0
6 16 HG   36   .070  11.13    365    11.204   10070        3    127    109    .077     .3       10    8.4     23    16.0
7  3 HG   62   .100  14.26    825    14.366   24721       11    348    500    .113    1.2       39   56.5    104     3.0
8 16 HG   28   .070  10.97    425    11.043   10070        3    129    129    .077     .2       10    9.9     23    16.0
9 C.T.   346   .080  11.73     35    11.845    2177        6     30      2    .143     .9        4     .2      0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .2        4    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .3        7    6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .2        5    6.3
FOUR CYCLE COMPOSITE -
                                 HC- FID  0.35(     .3) + 0.65(     .2) =     .237   GM/BHP HR
                                 CO- NDIR 0.35(    6.9) + 0.65(    5.1) =    5.718   GM/BHP HR
                                 NO2-CL   0.35(    6.4) + 0.65(    6.3) =    6.350   GM/BHP HR
                                                   CORRECTED NO2 =    6.821   GM/BHP HR
                                                            BSFC =     .745   LB/BHP HR
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                    TABLE G-29. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-HP TEST 115  RUN-2   -CAT                    10-12-73      K =1.079      HUM =106.9  GR/LB
-----------------------------------------------------------------------------------------------------------------
           CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR             MAN.
MODE        HC     CO     CO2     NO    CARBON   CONS.      HC      CO     NO2     FACT.   HC      CO     NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE      52    .090   11.41   212   11.506    2087       10      15      13     .232    2.4     3     3.0     0    17.0
2 16 HG     20    .020   11.15   264   11.192   10020       19      36      29     .077    1.5     3     2.2    23    16.0
3 10 HG     25    .020   12.42  1486   12.467   15876       34      51     628     .147    5.1     8    92.4    61    10.0
4 16 HG     21    .020   11.11   468   11.153   10020       20      36     190     .077    1.6     3    14.6    23    16.0
5 19 HG     20    .030   13.85   352   13.902    6895       11      30      54     .057     .6     2     3.1     1    19.0
6 16 HG     21    .020   11.22   364   11.263   10020       20      36     108     .077    1.6     3     8.3    23    16.0
7  3 HG     20    .500   14.41   551   14.932   24721       36    1672     303     .113    4.0   189    34.2   104     3.0
8 16 HG     19    .030   10.75   392   10.901   10020       19      52     121     .077    1.5     4     9.3    23    16.0
9 C.T.      54    .040   11.50    39   11.598    2177       11      15       5     .143    1.6     2      .7     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7     8     6.0
1 IDLE      52    .090   11.41   212   11.506    2087       10      15      13     .232    2.4     3     3.0     0    17.0
2 16 HG     19    .020   11.19   329   11.231   10020       18      36      98     .077    1.4     3     7.5    23    16.0
3 10 HG     21    .030   12.35  1304   12.403   15876       29      78     554     .147    4.3    11    81.5    61    10.0
4 16 HG     21    .030   11.12   407   11.173   10020       20      55     122     .077    1.6     4     9.4    23    16.0
5 19 HG     18    .020   13.72   227   13.738    6895       10      20      38     .057     .6     1     2.2     1    19.0
6 16 HG     21    .030   11.22   326   11.253   10020       20      54     112     .077    1.6     4     8.6    23    16.0
7  3 HG     19    .210   14.46   686   14.671   24721       35     716     384     .113    3.9    81    43.4   104     3.0
8 16 HG     19    .010   10.85   419   10.881   10020       19      19     129     .077    1.5     1     9.9    23    16.0
9 C.T.      56    .050   11.81    66   11.920    2177       11      18       4     .143    1.6     3      .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7     4     6.0
1 IDLE      29    .090   11.59    55   11.661    2087        6      19       3     .232    1.3     3      .6     0    17.0
2 16 HG     20    .020   11.22   372   11.262   10020       19      36     110     .077    1.5     3     8.5    23    16.0
3 10 HG     23    .030   12.37  1335   12.425   15876       32      77     566     .147    4.7    11    83.3    61    10.0
4 16 HG     23    .010   11.31   442   11.345   10020       22      18     130     .077    1.7     1    10.0    23    16.0
5 19 HG     17    .020   13.75   200   13.788    6895        9      20      33     .057     .5     1     1.9     1    19.0
6 16 HG     20    .020   11.34   377   11.382   10020       19      36     111     .077    1.5     3     8.5    23    16.0
7  3 HG     20    .110   14.32   838   14.452   24721       37     380     476     .113    4.2    43    53.8   104     3.0
8 16 HG     19    .020   10.83   399   10.871   10020       19      37     123     .077    1.5     3     9.4    23    16.0
9 C.T.      67    .090   11.77    67   11.932    2177       13      33       4     .143    1.9     5      .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7     3     6.3
1 IDLE      29    .090   11.59    55   11.661    2087        6      19       3     .232    1.3     3      .6     0    17.0
2 16 HG     21    .020   11.26   364   11.303   10020       20      35     108     .077    1.6     3     8.3    23    16.0
3 10 HG     24    .030   12.44  1348   12.496   15876       33      77     569     .147    4.8    11    83.6    61    10.0
4 16 HG     24    .010   11.27   416   11.306   10020       23      18     123     .077    1.8     1     9.5    23    16.0
5 19 HG     19    .020   13.94   233   13.981    6895       10      20      38     .057     .6     1     2.2     1    19.0
6 16 HG     22    .010   11.26   399   11.314   10020       21      18     118     .077    1.6     1     9.1    23    16.0
7  3 HG     20    .120   14.34   823   14.532   24721       37     584     493     .113    4.2    66    55.7   104     3.0
8 16 HG     21    .010   10.97   437   11.003   10020       21      18     133     .077    1.6     1    10.2    23    16.0
9 C.T.      51    .030   11.68    67   11.765    2177       10      11       4     .143    1.5     2      .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .7     3     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .7     6     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .7     3     6.4
FOUR CYCLE COMPOSITE -
                                        HC= NDIR 0.35(     .7) + 0.65(     .7) =     .680   GM/BHP HR
                                        CO= NDIR 0.35(    5.9) + 0.65(    2.9) =    3.974   GM/BHP HR
                                        NO2=NDIR 0.35(    6.0) + 0.65(    6.4) =    6.259   GM/BHP HR
                                                                CORRECTED NO2 =    6.756   GM/BHP HR
                                                                         BSFC =     .745   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR             MAN.
MODE       HC-FID   CO     CO2   NO-CL  CARBON   CONS.      HC      CO     NO2     FACT.  HC-FID    CO   NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE     286    .040   11.41   210   11.479    2087        5      15      13     .232    1.2     3     2.9     0    17.0
2 16 HG     64    .020   11.14   255   11.174   10020        6      36      76     .077     .4     3     5.8    23    16.0
3 10 HG     49    .020   12.42  1425   12.450   15876       13      52     603     .147    1.8     8    88.7    61    10.0
4 16 HG     50    .020   11.11   500   11.135   10020        4      37     150     .077     .3     3    11.6    23    16.0
5 19 HG     35    .030   13.85   350   13.883    6895        2      30      58     .057     .1     2     3.3     1    19.0
6 16 HG     43    .020   11.22   338   11.244   10020        4      36     100     .077     .3     3     7.7    23    16.0
7  3 HG     75    .500   14.41   475   14.918   24721       12    1674     261     .113    1.4   189    29.5   104     3.0
8 16 HG     37    .030   10.75   375   10.784   10020        3      52     116     .077     .2     4     9.0    23    16.0
9 C.T.     346    .040   11.50   110   11.575    2177        3      15       7     .143     .4     2     1.0     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .2     8     5.7
1 IDLE     286    .040   11.41   210   11.479    2087        5      15      13     .232    1.2     3     2.9     0    17.0
2 16 HG     46    .020   11.19   300   11.215   10020        4      36      89     .077     .3     3     6.8    23    16.0
3 10 HG     77    .030   12.35  1262   12.388   15876       10      78     537     .147    1.4    11    78.9    61    10.0
4 16 HG     40    .030   11.12   210   11.154   10020        4      55      63     .077     .3     4     4.8    23    16.0
5 19 HG     34    .020   13.70   355   13.723    6895        2      20      59     .057     .1     1     3.4     1    19.0
6 16 HG     36    .030   11.20   175   11.234   10020        3      59      52     .077     .3     4     4.0    23    16.0
7  3 HG     67    .210   14.44   680   14.657   24721       11     715     347     .113    1.3    81    39.2   104     3.0
8 16 HG     43    .010   10.85   580   10.864   10020        4      19     178     .077     .3     1    13.7    23    16.0
9 C.T.     395    .050   11.81   150   11.900    2177        7      18       9     .143    1.0     3     1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .2     4     5.6
1 IDLE     190    .090   11.59    25   11.699    2087        3      19       1     .232     .6     3      .3     0    17.0
2 16 HG     45    .020   11.22   355   11.245   10020        4      36     106     .077     .3     3     8.1    23    16.0
3 10 HG     71    .030   12.37  1298   12.407   15876        9      78     547     .147    1.3    11    80.4    61    10.0
4 16 HG     34    .010   11.31   410   11.324   10020        3      18     121     .077     .2     1     9.3    23    16.0
5 19 HG     23    .020   13.25   195   13.272    6895        1      20      32     .057     .1     1     1.8     1    19.0
6 16 HG     33    .020   11.34   365   11.363   10020        4      36     107     .077     .2     3     8.3    23    16.0
7  3 HG     56    .110   14.32   750   14.436   24721       10     381     426     .113    1.1    43    48.2   104     3.0
8 16 HG     25    .020   10.83   395   10.853   10020        2      37     122     .077     .2     3     9.4    23    16.0
9 C.T.     382    .090   11.77   150   11.898    2177        7      33       9     .143    1.0     5     1.3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .2     3     6.0
1 IDLE     190    .090   11.59    25   11.699    2087        3      19       1     .232     .6     3      .3     0    17.0
2 16 HG     42    .020   11.26   335   11.284   10020        4      36      99     .077     .3     3     7.6    23    16.0
3 10 HG     69    .030   12.44  1275   12.477   15876        9      77     539     .147    1.3    11    79.2    61    10.0
4 16 HG     33    .010   11.27   400   11.283   10020        3      18     119     .077     .2     1     9.1    23    16.0
5 19 HG     24    .020   13.94   195   13.962    6895        1      20      32     .057     .1     1     1.8     1    19.0
6 16 HG     33    .010   11.28   390   11.293   10020        3      18     115     .077     .2     1     8.9    23    16.0
7  3 HG     56    .120   14.34   800   14.516   24721        9     585     452     .113    1.1    66    51.1   104     3.0
8 16 HG     29    .010   10.97   420   10.982   10020        2      19     128     .077     .2     1     9.8    23    16.0
9 C.T.     311    .030   11.68   160   11.741    2177        6      11      10     .143     .8     2     1.4     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     .2     3     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     .2     6     5.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     .2     3     6.0
FOUR CYCLE COMPOSITE -
                                        HC= FID  0.35(     .2) + 0.65(     .2) =     .196   GM/BHP HR
                                        CO= NDIR 0.35(    5.9) + 0.65(    2.9) =    3.974   GM/BHP HR
                                        NO2=CL   0.35(    5.7) + 0.65(    6.0) =    5.904   GM/BHP HR
                                                                CORRECTED NO2 =    6.372   GM/BHP HR
                                                                         BSFC =     .745   LB/BHP HR
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                          TABLE G-30.MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP TEST 115  RUN=5   O-CAT, NO AIR        10-15-73     K =1.063     HUM = 98.6  GR/LB
----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR         WT.       WEIGHTED GM/HR                MAN.
MODE          HC      CO     CO2     NO      CARBON   CONS.     HC      CO     NO2      FACT.   HC       CO     NO2     HP      VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        155   .880   12.67    105     13.717    2359      29     306      6      .232    6.7      71     1.4     0      16.9
2 16 HG        49   .090   14.00    307     14.133   10115      38     116     71      .077    2.9       9     5.5    23      16.0
3 10 HG        65   .180   14.44   1650     14.469   15649      53     175    692      .147    7.7      26    87.1    63      10.0
4 16 HG        33   .090   13.99    379     14.106   10115      26     116     90      .077    2.0       9     6.9    23      16.0
5 19 HG        33   .060   13.63    172     13.726    7167      19      63     30      .057    1.1       4     1.7     2      19.0
6 16 HG        31   .070   14.11    449     14.213   10115      24     101    106      .077    1.8       8     8.2    23      16.0
7  3 HG       114  1.220   13.75    716     15.093   24721     202    4036    389      .113   22.9     456    44.0   107       3.0
8 16 HG        35   .080   14.09    482     14.208   10115      27     115    114      .077    2.1       9     8.8    23      16.0
9 C.T.         87   .060   11.66     88     11.814    2359      19      24      6      .143    2.7       3      .8     0      24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.8      21     5.8
1 IDLE        155   .880   12.67    105     13.717    2359      29     306      6      .232    6.7      71     1.4     0      16.9
2 16 HG        34   .060   13.98    360     14.082   10115      26      87     86      .077    2.0       7     6.6    23      16.0
3 10 HG        39   .060   14.34   1584     14.442   15649      46     131    572      .147    6.7      19    84.0    63      10.0
4 16 HG        34   .060   14.10    512     14.197   10115      26      86    121      .077    2.0       7     9.3    23      16.0
5 19 HG        29   .060   13.63    170     13.721    7167      16      63     29      .057     .9       4     1.7     2      19.0
6 16 HG        34   .230   14.35    557     14.617   10115      25     322    128      .077    2.0      25     9.9    23      16.0
7  3 HG       111  1.090   13.83    687     15.040   24721     197    3619    375      .113   22.3     409    42.4   107       3.0
8 16 HG        36   .060   14.02    551     14.119   10115      28      87    131      .077    2.1       7    10.1    23      16.0
9 C.T.         77   .060   11.70     80     11.923    2359      16      24      5      .143    2.4       3      .8     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.7      19     5.9
1 IDLE        106   .250   13.83     23     14.694    2359      18     243      4      .232    4.3      56      .9     0      16.9
2 16 HG        34   .060   14.06    451     14.156   10115      25      87    107      .077    2.0       7     8.2    23      16.0
3 10 HG        34   .060   14.32   1580     14.421   15649      45     132    569      .147    6.5      19    83.7    63      10.0
4 16 HG        41   .060   14.13    530     14.223   10115      24      86    125      .077    1.8       7     9.6    23      16.0
5 19 HG        27   .061   13.76    152     13.849    7167      15      63     26      .057     .9       4     1.5     2      19.0
6 16 HG        41   .090   14.09    474     14.213   10115      24     129    112      .077    1.8      10     8.6    23      16.0
7  3 HG       111  1.020   13.85    711     14.990   24721     198    3398    389      .113   22.3     384    44.0   107       3.0
8 16 HG        35   .060   14.08    591     14.178   10115      27      86    126      .077    2.1       7     9.7    23      16.0
9 C.T.         80   .060   11.70     79     11.926    2359      17      24      5      .143    2.4       3      .7     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.6      18     5.9
1 IDLE        106   .250   13.83     23     14.694    2359      18     243      4      .232    4.3      56      .9     0      16.9
2 16 HG        35   .080   14.10    434     14.218   10115      27     115    103      .077    2.1       9     7.9    23      16.0
3 10 HG        34   .060   14.45   1618     14.552   15649      55     130    578      .147    6.7      19    84.9    63      10.0
4 16 HG        32   .060   14.22    567     14.315   10115      24      86    130      .077    1.9       7    10.0    23      16.0
5 19 HG        23   .060   13.73    181     13.821    7167      16      63     31      .057     .9       4     1.8     2      19.0
6 16 HG        44   .200   14.32    565     14.557   10115      26     281    130      .077    2.0      22    10.0    23      16.0
7  3 HG       112  1.037   13.75    724     15.001   24721     199    3424    396      .113   22.5     387    44.8   107       3.0
8 16 HG        35   .060   13.94    444     14.039   10115      28      87    106      .077    2.2       7     8.2    23      16.0
9 C.T.         75   .060   11.93     29     11.962    2359      16      24      5      .143    2.3       3      .7     0      24.9
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.6      18     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    1.7      20     5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    1.6      18     5.9
FOUR CYCLE COMPOSITE =
                                     HC- NDIR 0.35(    1.7) + 0.65(    1.6) =    1.615   GM/BHP HR
                                     CO- NDIR 0.35(   20.2) + 0.65(   17.8) =   18.634   GM/BHP HR
                                     NO2-NDIR 0.35(    5.8) + 0.65(    5.9) =    5.888   GM/BHP HR
                                                       CORRECTED NO2 =    6.259   GM/BHP HR
                                                                BSFC =     .738   LB/BHP HR


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              CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR         WT.       WEIGHTED GM/HR                MAN.
MODE         HC-FI    CO     CO2   NO-CL     CARBON   CONS.     HC      CO     NO2      FACT.  HC-FID     CO   NO2-CL   HP      VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       3151   .880   12.67     47     13.865    2359      54     302      3      .232   12.4      70      .6     0      16.9
2 16 HG       242   .090   14.00    265     14.110   10115      21     116     63      .077    1.6       9     4.9    23      16.0
3 10 HG       220   .080   14.44   1500     14.497   15649      29     175    539      .147    4.3      26    79.3    63      10.0
4 16 HG        79   .180   13.99    425     14.078   10115       6     116     89      .077     .4       9     6.9    23      16.0
5 19 HG        63   .060   13.63    150     13.696    7167       3      63     26      .057     .2       4     1.5     2      19.0
6 16 HG        79   .070   14.11    413     14.188   10115       6     101     98      .077     .5       8     7.5    23      16.0
7  3 HG      1492  1.220   13.75    613     15.169   24721     325    4016    332      .113   36.7     454    37.5   107       3.0
8 16 HG       156   .080   14.09    450     14.186   10115      11     115    107      .077     .9       9     8.2    23      16.0
9 C.T.        643   .060   11.66     45     11.789    2359      14      24      3      .143    2.0       3      .4     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    2.1      21     5.2
1 IDLE       3151   .880   12.67     47     13.865    2359      54     302      3      .232   12.4      70      .6     0      16.9
2 16 HG        94   .060   13.99    425     14.060   10115       7      87     78      .077     .6       7     6.0    23      16.0
3 10 HG       193   .060   14.34   1463     14.419   15649      21     132    527      .147    3.1      19    77.5    63      10.0
4 16 HG        63   .060   14.10    475     14.166   10115       5      87    113      .077     .3       7     8.7    23      16.0
5 19 HG        35   .060   13.63    138     13.693    7167       2      63     24      .057     .1       4     1.4     2      19.0
6 16 HG        64   .230   14.36    513     14.586   10115       4     322    118      .077     .3      25     9.1    23      16.0
7  3 HG      2106  1.030   13.83    613     15.121   24721     328    3602    333      .113   37.1     407    37.6   107       3.0
8 16 HG        49   .060   14.02    500     14.090   10115       7      87    119      .077     .5       7     9.2    23      16.0
9 C.T.        610   .060   11.78     36     11.901    2359      12      24      2      .143    1.7       3      .3     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    2.0      19     5.3
1 IDLE       1829   .250   13.43     12     14.763    2359      29     242      1      .232    6.8      56      .1     0      16.9
2 16 HG        85   .060   14.06    400     14.128   10115       6      87     95      .077     .5       7     7.3    23      16.0
3 10 HG       185   .060   14.32   1525     14.398   15649      20     132    568      .147    3.0      19    83.5    63      10.0
4 16 HG        57   .150   14.13    475     14.196   10115       4      86    112      .077     .3       7     8.7    23      16.0
5 19 HG        50   .060   13.76    125     13.825    7167       3      63     22      .057     .1       4     1.2     2      19.0
6 16 HG        43   .090   14.09    463     14.184   10115       3     130    110      .077     .2      10     8.4    23      16.0
7  3 HG      2161  1.020   13.85    613     15.066   24721     354    3376    333      .113   40.0     382    37.7   107       3.0
8 16 HG       100   .060   14.08    500     14.150   10115       7      87    119      .077     .5       7     9.1    23      16.0
9 C.T.        638   .060   11.74     38     11.904    2359      13      24      2      .143    1.8       3      .3     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.9      17     5.5
1 IDLE       1829   .250   13.43     12     14.763    2359      29     242      1      .232    6.8      56      .1     0      16.9
2 16 HG       100   .190   14.13    399     14.190   10115       7     115     92      .077     .5       9     7.1    23      16.0
3 10 HG       213   .060   14.45   1513     14.531   15649      23     131    541      .147    3.4      19    79.5    63      10.0
4 16 HG        71   .061   14.22    488     14.287   10115       5      86    115      .077     .4       7     8.8    23      16.0
5 19 HG        28   .060   13.7     150     13.793    7167       1      63     26      .057     .1       4     1.5     2      19.0
6 16 HG        57   .200   14.32    425     14.526   10115       4     281    110      .077     .3      22     8.5    23      16.0
7  3 HG      2148  1.030   13.95    600     15.095   24721     352    3407    326      .113   39.7     385    36.9   107       3.0
8 16 HG        99   .060   13.94    459     14.010   10115       7      88    109      .077     .6       7     8.3    23      16.0
9 C.T.        610   .060   11.93     34     11.941    2359      12      24      2      .143    1.7       3      .3     0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------    1.9      18     5.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    2.0      20     5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    1.9      18     5.4
FOUR CYCLE COMPOSITE =
                                     HC- FID  0.35(    2.0) + 0.65(    1.9) =    1.933   GM/BHP HR
                                     CO- NDIR 0.35(   20.1) + 0.65(   17.7) =   18.540   GM/BHP HR
                                     NO2-CL   0.35(    5.2) + 0.65(    5.4) =    5.353   GM/BHP HR
                                                       CORRECTED NO2 =    5.690   GM/BHP HR
                                                                BSFC =     .739   LB/BHP HR
                          TABLE G-31. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-HP  TEST 126 RUN 1   -CAT EGR 10           10-24-73      = 21,003      HP = 76.1  LB/HR
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               CONCENTRATION AS MEASURED    TOTAL     FUEL        CALCULATED GM/HR         WT.         WEIGHTED GM/HR              CAT.
MODE           HC      CO     CO2     NO     CARBON    CONS.       HC      CO      NO2     FACT.    HC        CO    CO2    NO      FAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE        108    .040    9.77     48     9.927     2359       28      19       4     .232     6.6        4      .5     0      17.4
2 16 HG        23    .010   10.92    291    10.955     9626       22      18      22     .077     1.7        1     6.6    13      16.0
3 10 HG        25    .010   11.75    317    11.787    14107       32      24     126     .147     4.8        4    11.5    40      10.0
4 16 HG        20    .010   10.98    427    11.012     9626       19      17     123     .077     1.6        1     9.4    13      16.0
5 19 HG        20    .010   13.14    199    13.172     7167       13      11      36     .057      .7        1      .7     1      19.0
6 16 HG        19    .010   11.04    440    11.071     9626       18      17     126     .077     1.4        1     9.7    14      16.0
7  3 HG        23    .220   14.14   1221    14.425    24676       42     760     693     .113     4.8       86    24.6   173       3.0
8 16 HG        19    .010   11.04    541    11.071     9626       18      17     155     .077     1.4        1    11.5    13      16.0
9 C.T.         84    .010   10.21     85    10.311     2445       22       5       7     .143     3.1        1     1.0     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.2        6     6.3
1 IDLE        108    .040    9.77     48     9.927     2359       28      19       4     .232     6.6        4      .5     0      17.4
2 16 HG        23    .010   11.04    399    11.075     9626       21      17     114     .077     1.6        1     9.1    14      16.0
3 10 HG        28    .010   11.85    330    11.890    14107       36      24     130     .147     6.3        4    19.1    40      10.0
4 16 HG        19    .010   11.04    403    11.071     9626       18      17     138     .077     1.4        1    11.6    13      16.0
5 19 HG        20    .010   13.21    199    13.242     7167       12      11      36     .057      .7        1      .7     1      19.0
6 16 HG        20    .010   11.10    497    11.132     9626       18      17     141     .077     1.4        1    10.4    12      16.0
7  3 HG        23    .170   14.14   1351    14.375    24676       43     580     770     .113     4.8       67    87.1   173       3.0
8 16 HG        19    .010   11.04    555    11.071     9626       18      17     159     .077     1.4        1    12.0    13      16.0
9 C.T.         75    .010   10.10     97    10.191     2445       20       5       8     .143     2.4        1     1.1     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.2        4     7.1
1 IDLE         84    .050   10.21     73    10.351     2359       21      23       6     .232     4.4        6     1.3     0      17.4
2 16 HG        23    .010   11.00    435    11.035     9626       21      17     125     .077     1.7        1     6.6    13      16.0
3 10 HG        23    .010   11.79    338    11.825    14107       30      24     134     .147     4.4        4    11.7    40      10.0
4 16 HG        19    .010   11.04    497    11.071     9626       18      17     142     .077     1.4        1    10.5    13      16.0
5 19 HG        19    .010   13.21    200    13.241     7167       11      11      36     .057      .6        1     2.1     1      19.0
6 16 HG        19    .010   11.10    460    11.141     9626       18      17     131     .077     1.4        1    10.1    13      16.0
7  3 HG        20    .150   14.08   1485    14.252    24676       37     525     854     .113     4.2       59    96.6   173       3.0
8 16 HG        19    .010   11.04    589    11.071     9626       18      17     167     .077     1.4        1    12.6    13      16.0
9 C.T.         69    .010   10.44     98    10.525     2445       18       5       8     .143     2.6        1     1.1     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.0        3     7.6
1 IDLE         84    .050   10.21     73    10.351     2359       21      23       6     .232     4.8        6     1.3     0      17.4
2 16 HG        23    .010   10.98    413    11.015     9626       21      17     119     .077     1.7        1     6.1    13      16.0
3 10 HG        23    .010   11.85    364    11.885    14107       29      24     143     .147     4.3        4    21.1    40      10.0
4 16 HG        19    .010   11.04    511    11.071     9626       18      17     146     .077     1.4        1    11.2    13      16.0
5 19 HG        20    .010   13.21    199    13.242     7167       12      11      36     .057      .7        1     2.1     1      19.0
6 16 HG        19    .010   11.04    526    11.071     9626       18      17     150     .077     1.4        1    11.6    13      16.0
7  3 HG        23    .160   14.03   1584    14.215    24676       43     561     913     .113     4.9       63   103.2   173       3.0
8 16 HG        19    .010   11.04    599    11.071     9626       18      17     171     .077     1.4        1    13.2    13      16.0
9 C.T.         70    .010   10.44     98    10.526     2495       18       5       8     .143     2.6        1     1.1     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------  1.1        4     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------  1.2        4     6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------  1.0        4     7.2
FOUR CYCLE COMPOSITE =                     HC= NDIR 0.35(      1.2) + 0.65(      1.0) =     1.088   GM/BHP HR
                                           CO= NDIR 0.35(      4.2) + 0.65(      3.5) =     3.754   GM/BHP HR
                                           NO2=NDIR 0.35(      6.7) + 0.65(      7.8) =     7.367   GM/BHP HR
                                                                        CORRECTED NO2 =     7.391   GM/BHP HR
                                                                                 BSFC =      .922   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL     FUEL        CALCULATED GM/HR         WT.         WEIGHTED GM/HR              CAT.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.       HC      CO      NO2     FACT.   HC-FID     CO   CO2-CL   NO      FAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE        911    .040    9.77     25     9.901     2359       22      19       2     .232     5.0        4      .5     0      17.4
2 16 HG        73    .010   10.92    233    10.937     9626        6      18      67     .077      .5        1     5.2    13      16.0
3 10 HG        93    .010   11.76    300    11.769    14107       11      24     114     .147     1.6        4    17.6    40      10.0
4 16 HG        45    .010   10.98    425    10.995     9626        4      18     122     .077      .3        1     9.4    13      16.0
5 19 HG        26    .010   13.14    180    13.153     7167        1      11      33     .057      .1        1     1.9     1      19.0
6 16 HG        41    .010   11.04    435    11.054     9626        4      17     124     .077      .3        1     9.6    13      16.0
7  3 HG       122    .220   14.18   1158    14.412    24676       21     761     658     .113     2.4       86    74.4   173       3.0
8 16 HG        36    .010   11.04    525    11.054     9626        3      17     150     .077      .2        1    11.6    13      16.0
9 C.T.        567    .010   10.21     50    10.277     2445       14       5       4     .143     2.0        1      .6     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .6        5     6.1
1 IDLE        911    .040    9.77     25     9.901     2359       22      19       2     .232     5.0        4      .5     0      17.4
2 16 HG        68    .010   11.04    395    11.057     9626        6      17     113     .077      .5        1     8.7    13      16.0
3 10 HG        87    .010   11.85    300    11.869    14107       10      24     118     .147     1.5        4    17.4    40      10.0
4 16 HG        41    .010   11.04    470    11.054     9626        4      17     134     .077      .3        1    10.4    13      16.0
5 19 HG        25    .010   13.21    175    13.222     7167        1      11      31     .057      .1        1     1.8     1      19.0
6 16 HG        40    .010   11.10    493    11.114     9626        3      17     140     .077      .3        1    10.8    13      16.0
7  3 HG        91    .170   14.18   1260    14.359    24676       16     590     719     .113     1.8       67    81.2   173       3.0
8 16 HG        29    .010   11.04    533    11.053     9626        2      17     153     .077      .2        1    11.7    13      16.0
9 C.T.        465    .010   10.10     55    10.156     2495       11       5       4     .143     1.6        1      .6     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .5        4     6.6
1 IDLE        538    .050   10.21     40    10.314     2359       12      23       3     .232     2.8        6      .7     0      17.4
2 16 HG        66    .010   11.00    415    11.017     9626        6      17     119     .077      .4        1     9.2    13      16.0
3 10 HG        73    .010   11.79    320    11.807    14107        9      24     127     .147     1.3        4    18.7    40      10.0
4 16 HG        41    .010   11.04    480    11.054     9626        4      17     137     .077      .3        1    10.6    13      16.0
5 19 HG        26    .010   13.21    180    13.223     7167        1      11      32     .057      .1        1     1.8     1      19.0
6 16 HG        36    .010   11.10    445    11.119     9626        3      17     127     .077      .2        1     9.8    13      16.0
7  3 HG        88    .150   14.08   1433    14.239    24676       15     525     824     .113     1.7       59    93.2   173       3.0
8 16 HG        29    .010   11.04    583    11.053     9626        2      17     167     .077      .2        1    12.8    13      16.0
9 C.T.        439    .010   10.44     55    10.494     2445       10       5       4     .143     1.6        1      .6     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .4        3     7.6
1 IDLE        538    .050   10.21     40    10.314     2359       12      23       3     .232     2.8        6      .7     0      17.4
2 16 HG        63    .010   10.98    386    10.996     9626        5      17     111     .077      .4        1     8.5    13      16.0
3 10 HG        73    .010   11.85    325    11.867    14107        9      24     128     .147     1.3        4    18.8    40      10.0
4 16 HG        37    .010   11.04    480    11.054     9626        3      17     137     .077      .2        1    10.6    13      16.0
5 19 HG        24    .010   13.21    163    13.223     7167        2      11      29     .057      .1        1     1.7     1      19.0
6 16 HG        34    .010   11.04    508    11.053     9626        3      17     146     .077      .2        1    11.2    13      16.0
7  3 HG        88    .160   14.03   1450    14.199    24676       15     562     837     .113     1.7       63    94.5   173       3.0
8 16 HG        28    .010   11.04    563    11.053     9626        2      17     161     .077      .2        1    12.4    13      16.0
9 C.T.        439    .010   10.44     50    10.494     2445       10       5       4     .143     1.5        1      .6     0      24.2
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------------   .4        4     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------   .5        4     6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------   .4        4     7.2
FOUR CYCLE COMPOSITE =                     HC= FID  0.35(       .5) + 0.65(       .4) =      .444   GM/BHP HR
                                           CO= NDIR 0.35(      4.2) + 0.65(      3.5) =     3.759   GM/BHP HR
                                           NO2=CL   0.35(      6.3) + 0.65(      7.3) =     6.937   GM/BHP HR
                                                                        CORRECTED NO2 =     6.939   GM/BHP HR
                                                                                 BSFC =      .922   LB/BHP HR
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                      TABLE G-32.  [illegible] EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP  TEST 126  RUN 2  [illegible] EGR 10          [illegible]-73       [illegible]        [illegible]  GM/LB
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                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR           CAL.
MODE            HC     CO     CO2     NO     CARBON    CONS.     HC     CO     NO2    FACT.    HC       CO     NO2             FAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE          47   .030   11.28     61    11.361     2359     1?     13      6    .232     2.4       5     1.1             17.4
2 16 HG         19   .060   11.04    304    11.115     9526     14    114     86    .077     1.0       ?     6.7      13     16.0
3 10 HG         19   .060   12.18    371    12.255    14107     17    141    162    .147     2.6      21    20.6      40     10.0
4 16 HG         19   .060   11.28    277    11.355     9526     13    102     77    .077     1.0       8     5.9      13     16.0
5 19 HG         19   .060   13.73    225    13.805     7167      8     63     40    .057      .4       4     2.2       1     19.0
6 16 HG         19   .060   11.16    251    11.235     9526     13    103     71    .077     1.0       8     5.4      13     16.0
7  3 HG         19   .200   14.65   1012    14.865    24626     25    671    558    .113     2.8      76    63.1     173      3.0
8 16 HG         19   .060   11.28    290    11.355     9526     13    102     81    .077     1.0       8     6.2      13     16.0
9 C.T.          84   .060   11.53     45    11.695     2495     20     26      6    .143     2.9       4      .6       0     24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .7       6     6.1
1 IDLE          47   .030   11.28     61    11.361     2359     11     13      6    .232     2.4       3     1.1       0     17.4
2 16 HG         19   .060   11.28    225    11.354     9526     13    102     63    .077     1.1       8     4.9      13     16.0
3 10 HG         19   .060   12.31    349    12.385    14107     17    138    151    .147     2.5      20    22.2      40     10.0
4 16 HG         19   .060   11.28    277    11.355     9526     13    102     77    .077     1.0       8     5.9      13     16.0
5 19 HG         19   .060   13.88    225    13.955     7167      8     62     38    .057      .4       4     2.2       1     19.0
6 16 HG         19   .060   11.28    277    11.355     9526     13    102     77    .077     1.0       8     5.9      13     16.0
7  3 HG         19   .170   14.65   1167    14.841    24626     34    571    644    .113     3.8      64    72.8     173      3.0
8 16 HG         19   .060   11.41    349    11.485     9526     13    101     95    .077     1.0       8     7.3      13     16.0
9 C.T.          79   .080   11.92     73    12.085     2495     18     33      5    .143     2.5       5      .7              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .7       6     6.1
1 IDLE          23   .050   11.66     72    11.735     2359      5     20      5    .232     1.2       5     1.1             17.4
2 16 HG         19   .060   11.16    250    11.235     9526     13    103     70    .077     1.0       8     5.4      13     16.0
3 10 HG         19   .060   12.05    385    12.131    14107     24    141    166    .147     3.5      21    21.[illegible] 40   10.0
4 16 HG         19   .060   11.28    290    11.355     9526     13    102     81    .077     1.0       8     6.2      13     16.0
5 19 HG         19   .060   13.88    224    13.955     7167      8     62     38    .057      .4       4     2.2       1     19.0
6 16 HG         19   .060   11.41    290    11.485     9526     13    101     80    .077     1.0       8     6.1      13     16.0
7  3 HG         19   .170   14.65   1258    14.841    24626     34    571    694    .113     3.8      64    78.4     173      3.0
8 16 HG         19   .060   11.28    330    11.355     9526     13    102     92    .077     1.0       8     7.1      13     16.0
9 C.T.          75   .010   11.79     73    11.881     2495     17      4      5    .143     2.4       1      .7              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .7       6     6.6
1 IDLE          23   .050   11.66     72    11.735     2359      5     20      5    .232     1.2       5     1.1             17.4
2 16 HG         19   .060   11.28    238    11.361     9526     17    102     66    .077     1.3       8     5.1      13     16.0
3 10 HG         19   .060   12.18    385    12.261    14107     24    139    142    .147     3.5      20    21.4      40     10.0
4 16 HG         19   .060   11.28    319    11.355     9526     13    102     89    .077     1.0       8     6.9      13     16.0
5 19 HG         19   .060   13.73    212    13.805     7167      8     63     37    .057      .4       4     2.1       1     19.0
6 16 HG         19   .060   11.41    277    11.485     9526     13    101     76    .077     1.0       8     5.8      13     16.0
7  3 HG         19   .180   14.65   1185    14.851    24626     34    604    654    .113     3.8      68    73.9     173      3.0
8 16 HG         19   .060   11.41    385    11.485     9526     13    101    106    .077     1.0       8     8.2      13     16.0
9 C.T.          79   .080   12.05     73    12.215     2495     17     33      5    .143     2.5       5      .7              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .7       6     6.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          .7       6     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          .7       6     6.6
FOUR CYCLE COMPOSITE -
                                       HC- NDIR 0.35(     .7) + 0.65(     .7) =      .709   GM/BHP HR
                                       CO- NDIR 0.35(    6.1) + 0.65(    5.9) =     5.984   GM/BHP HR
                                       NO2-NDIR 0.35(    5.9) + 0.65(    5.8) =     5.844   GM/BHP HR
                                                           CORRECTED NO2 =     5.771   GM/BHP HR
                                                                    BSFC =      .522   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.        WEIGHTED GM/HR           CAL.
MODE          HC-FID   CO     CO2   NO-CL    CARBON    CONS.     HC     CO     NO2    FACT.   HC-FID    CO   NO2-CL            FAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE         317   .030   11.28     31    11.342     2359      7     13      2    .232     1.6       3      .5             17.4
2 16 HG         56   .060   11.04    130    11.106     9526      5    104     37    .077      .4       8     2.8      13     16.0
3 10 HG         81   .060   12.18    330    12.298    14107      9    140    126    .147     1.4      21    18.5      40     10.0
4 16 HG         43   .060   11.28    265    11.344     9526      4    102     74    .077      .3       8     5.7      13     16.0
5 19 HG         25   .060   13.73    240    13.792     7167      1     63     41    .057      .1       4     2.3       1     19.0
6 16 HG         38   .060   11.16    215    11.224     9526      3    103     61    .077      .2       8     4.7      13     16.0
7  3 HG        108   .200   14.65    925    14.961    24626     18    671    510    .113     2.0      76    57.6     173      3.0
8 16 HG         33   .060   11.28    230    11.343     9526      3    102     64    .077      .2       8     4.9      13     16.0
9 C.T.         720   .060   11.53     40    11.662     2495     15     26      3    .143     2.2       4      .4              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .4       6     4.5
1 IDLE         317   .030   11.28     31    11.342     2359      7     13      2    .232     1.6       3      .5       0     17.4
2 16 HG         50   .060   11.28    190    11.345     9526      4    102     53    .077      .3       8     4.1      13     16.0
3 10 HG         62   .060   12.31    345    12.376    14107      7    138    131    .147     1.0      20    19.2      40     10.0
4 16 HG         36   .060   11.28    240    11.344     9526      3    102     67    .077      .2       8     5.2      13     16.0
5 19 HG         19   .060   13.88    195    13.942     7167      1     62     33    .057      .1       4     1.9       1     19.0
6 16 HG         31   .060   11.28    255    11.343     9526      3    102     71    .077      .2       8     5.5      13     16.0
7  3 HG         83   .170   14.65   1125    14.828    24626     14    571    622    .113     1.6      65    70.2     173      3.0
8 16 HG         24   .060   11.41    300    11.422     9526      2    101     83    .077      .2       8     6.4      13     16.0
9 C.T.         654   .080   11.92     30    12.065     2495     14     33      2    .143     1.9       5      .3              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .3       6     5.2
1 IDLE         207   .050   11.66     40    11.731     2359      4     20      3    .232     1.0       5      .7             17.4
2 16 HG         45   .060   11.16    220    11.225     9526      4    103     62    .077      .3       8     4.8      13     16.0
3 10 HG         69   .060   12.05    340    12.117    14107      8    141    131    .147     1.2      21    19.3      40     10.0
4 16 HG         34   .060   11.28    270    11.343     9526      3    102     75    .077      .2       8     5.8      13     16.0
5 19 HG         21   .060   13.88    220    13.942     7167      1     62     38    .057      .1       4     2.1       1     19.0
6 16 HG         33   .060   11.41    240    11.473     9526      3    101     72    .077      .2       8     5.5      13     16.0
7  3 HG         94   .170   14.65   1163    14.829    24626     16    571    642    .113     1.8      65    72.[illegible] 173   3.0
8 16 HG         28   .060   11.26    338    11.343     9526      2    102     94    .077      .2       8     7.2      13     16.0
9 C.T.         665   .010   11.79     40    11.867     2495     14      4      3    .143     2.0       1      .4              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .3       6     5.4
1 IDLE         207   .050   11.66     40    11.731     2359      4     20      3    .232     1.0       5      .6             17.4
2 16 HG         40   .060   11.28    210    11.344     9526      3    102     59    .077      .3       8     4.5      13     16.0
3 10 HG         66   .060   12.18    320    12.247    14107      8    140    122    .147     1.1      21    18.1      40     10.0
4 16 HG         31   .060   11.28    270    11.343     9526      3    102     75    .077      .2       8     5.8      13     16.0
5 19 HG         18   .060   13.73    210    13.792     7167      1     63     36    .057      .1       4     2.1       1     19.0
6 16 HG         28   .060   11.41    240    11.473     9526      2    101     66    .077      .2       8     5.1      13     16.0
7  3 HG         83   .180   14.65   1190    14.838    24626     14    604    607    .113     1.6      68    68.6     173      3.0
8 16 HG         22   .060   11.41    300    11.473     9526      2    101     83    .077      .1       8     6.4      13     16.0
9 C.T.         598   .080   12.05     30    12.190     2495     12     33      2    .143     1.8       5      .3              24.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------          .3       6     5.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------          .4       6     4.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------          .3       6     5.3
FOUR CYCLE COMPOSITE -
                                       HC- FID  0.35(     .4) + 0.65(     .3) =      .319   GM/BHP HR
                                       CO- NDIR 0.35(    6.1) + 0.65(    6.0) =     5.964   GM/BHP HR
                                       NO2-CL   0.35(    4.8) + 0.65(    5.3) =     5.120   GM/BHP HR
                                                           CORRECTED NO2 =     5.201   GM/BHP HR
                                                                    BSFC =      .422   LB/BHP HR
                      TABLE G-33. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-0P  TEST 126  RUN 1  HEAT EGR 10          10-21-73       F = 1.656      HUM = 46.0  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2      NO    CARBON    CONS.       HC      CO     NO2    FACT.    HC        CO    NO2    NO    VAC.
------ ----------------------------------------------------------------------------------------------------------------------------
1 IDLE        94    .060   10.21      98    10.372    2359        23      28       7    .232     5.4        6    1.7     0    17.4
2 16 HG       23    .010   10.68     250    10.716    9626        22      18      74    .077     1.7        1    5.7    13    16.0
3 10 HG       28    .010   11.92     331    11.960   14107        36      24     130    .147     5.2        4   19.1    40    10.0
4 16 HG       19    .010   10.92     290    10.951    9626        18      18      84    .077     1.4        1    6.4    13    16.0
5 19 HG       19    .010   13.00     303    13.031    7167        11      11      55    .057      .6        1    3.2     1    19.0
6 16 HG       19    .010   10.92     317    10.951    9626        18      18      92    .077     1.4        1    7.0    13    16.0
7  3 HG       23    .240   14.13    1097    14.646   24676        42     820     616    .113     4.7       93   69.6   103     3.0
8 16 HG       19    .010   11.04     371    11.071    9626        18      17     106    .077     1.4        1    8.2    13    16.0
9 C.T.        25    .010    9.99      61    10.081    2495        20       5       5    .143     2.9        1     .7     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------  1.1        6    5.6
1 IDLE        94    .060   10.21      98    10.372    2359        23      26       7    .232     5.4        6    1.7     0    17.4
2 16 HG       23    .010   10.80     290    10.835    9626        22      18      85    .077     1.7        1    6.6    14    16.0
3 10 HG       23    .010   11.92     330    11.955   14107        29      24     129    .147     4.3        4   19.0    40    10.0
4 16 HG       19    .010   10.92     250    10.951    9626        15      18      72    .077     1.4        1    5.6    11    16.0
5 19 HG       19    .010   13.00     330    13.031    7167        11      11      60    .057      .6        1    3.4     1    19.0
6 16 HG       19    .010   11.04     344    11.071    9626        18      17      96    .077     1.4        1    7.4    14    16.0
7  3 HG       23    .110   14.03    1221    14.165   24676        44     387     706    .113     4.9       44   79.8   107     3.0
8 16 HG       19    .010   11.16     441    11.191    9626        17      17     125    .077     1.3        1    9.6    13    16.0
9 C.T.        65    .010    9.66      60     9.740    2495        18       5       5    .143     2.6        1     .7          24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------  1.1        3    6.1
1 IDLE        88    .070    9.22      98     9.936    2359        23      34       4    .232     5.3        8     .9          17.4
2 16 HG       23    .010   10.80     277    10.835    9626        22      18      81    .077     1.7        1    6.2    13    16.0
3 10 HG       23    .010   11.79     303    11.825   14107        30      24     120    .147     4.4        4   17.6    40    10.0
4 16 HG       19    .010   10.80     212    10.831    9626        18      18      62    .077     1.4        1    4.8    13    16.0
5 19 HG       23    .010   12.86     330    12.895    7167        14      11      61    .057      .8        1    3.5     1    19.0
6 16 HG       19    .010   10.92     326    10.951    9626        18      18      94    .077     1.4        1    7.2    13    16.0
7  3 HG       23    .110   14.18    1221    14.315   24676        43     383     699    .113     4.8       43   79.0   113     3.0
8 16 HG       19    .010   10.92     464    10.951    9626        18      18     131    .077     1.4        1   10.1    13    16.0
9 C.T.        65    .010    9.92      61    10.000    2495        18       5       5    .143     2.6        1     .7     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------  1.1        3    6.1
1 IDLE        89    .070    9.22      98     9.936    2359        23      34       4    .232     5.3        8     .9     0    17.4
2 16 HG       23    .010   10.92     303    10.956    9626        22      18      87    .077     1.7        1    6.7    13    16.0
3 10 HG       28    .010   11.79     358    11.830   14107        36      24     142    .147     5.3        4   20.9    40    10.0
4 16 HG       24    .010   10.92     198    10.956    9626        23      18      57    .077     1.7        1    4.4    13    16.0
5 19 HG       23    .010   13.00     367    13.036    7167        14      11      65    .057      .8        1    3.7     1    19.0
6 16 HG       23    .010   10.92     317    10.956    9626        22      18      92    .077     1.7        1    7.0    13    16.0
7  3 HG       23    .140   14.19    1331    14.346   24676        43     486     760    .113     4.8       55   85.9   113     4.0
8 16 HG       19    .010   11.04     413    11.071    9626        18      17     118    .077     1.4        1    9.1    13    16.0
9 C.T.        65    .010    9.55      61     9.630    2495        18       5       5    .143     2.6        1     .6     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------  1.2        3    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------  1.1        4    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------  1.1        3    6.2
FOUR CYCLE COMPOSITE =                   HC= NDIR 0.35(    1.1) + 0.65(    1.1) =    1.115    GM/BHP HR
                                         CO= NDIR 0.35(    3.9) + 0.65(    3.1) =    3.368    GM/BHP HR
                                         NO2=NDIR 0.35(    5.9) + 0.65(    6.2) =    6.068    GM/BHP HR
                                                           CORRECTED NO2 =    6.403    GM/BHP HR
                                                                    BSFC =     .922    LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL        CALCULATED GM/HR       WT.       WEIGHTED GM/HR              MAN.
MODE          HC-FID  CO     CO2    NO-CL   CARBON    CONS.       HC      CO     NO2    FACT.   HC-FID     CO   NO2-CL  NO    VAC.
-----------------------------------------------------------------------------------------------------------------------------------
1 IDLE       253    .060   10.21      90    10.346    2359        17      28       7    .232     4.0        6    1.6     0    17.4
2 16 HG       73    .010   10.69     225    10.697    9626         6      18      67    .077      .5        1    5.1    13    16.0
3 10 HG       97    .010   11.92     365    11.990   14107        11      24     135    .147     1.7        4   19.5    40    10.0
4 16 HG       46    .010   10.92     300    10.935    9626         4      18      87    .077      .3        1    6.7    13    16.0
5 19 HG       22    .010   13.00     215    13.017    7167         4      11      39    .057      .2        1    2.2     1    19.0
6 16 HG       37    .010   10.92     265    10.934    9626         3      18      77    .077      .3        1    5.9    13    16.0
7  3 HG      120    .240   14.33    1000    14.582   24676        20     820     562    .113     2.3       93   63.6   103     3.0
8 16 HG       42    .010   11.04     140    11.054    9626         4      17      40    .077      .3        1    3.1    13    16.0
9 C.T.       588    .010    9.99      75    10.059    2495        15       5       6    .143     2.1        1     .9     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   .5        5    5.1
1 IDLE       253    .060   10.21      90    10.346    2359        17      28       7    .232     4.0        6    1.6     0    17.4
2 16 HG       73    .010   10.80     320    10.817    9626         6      18      94    .077      .5        1    7.2    13    16.0
3 10 HG       89    .010   11.92     300    11.930   14107        10      24     118    .147     1.5        4   17.3    40    10.0
4 16 HG       43    .010   10.92     340    10.936    9626         4      18      98    .077      .3        1    7.6    13    16.0
5 19 HG       46    .010   13.00     140    13.015    7167         3      11      26    .057      .1        1    1.5     1    19.0
6 16 HG       37    .010   11.04     390    11.056    9626         3      17     112    .077      .2        1    8.6    13    16.0
7  3 HG      101    .110   14.03    1113    14.150   24676        18     387     644    .113     2.0       44   72.6   113     3.0
8 16 HG       33    .010   11.16     155    11.173    9626         3      17      44    .077      .2        1    3.4    13    16.0
9 C.T.       581    .010    9.66      30     9.720    2495        15       5       3    .143     2.1        1     .4     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   .5        3    5.5
1 IDLE       825    .070    9.22      90     9.922    2359        20      34       7    .232     4.5        8    1.6     0    17.4
2 16 HG       70    .010   10.80     330    10.813    9626         6      18      96    .077      .5        1    7.4    13    16.0
3 10 HG      112    .010   11.79     280    11.811   14107        13      24     111    .147     2.0        4   16.3    40    10.0
4 16 HG       43    .010   10.80     340    10.814    9626         4      18      99    .077      .3        1    7.7    13    16.0
5 19 HG       75    .010   12.86     145    12.877    7167         4      11      27    .057      .2        1    1.5     1    19.0
6 16 HG       40    .010   10.92     305    10.934    9626         3      16      88    .077      .3        1    6.8    13    16.0
7  3 HG       94    .110   14.18    1148    14.299   24676        16     383     652    .113     1.8       43   73.7   113     3.0
8 16 HG       52    .010   10.92     175    10.936    9626         5      18      51    .077      .3        1    3.9    13    16.0
9 C.T.       533    .010    9.92      30     9.983    2495        13       5       2    .143     1.9        1     .4     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   .5        3    5.5
1 IDLE       825    .070    9.22      90     9.922    2359        20      34       7    .232     4.6        8    1.6     0    17.4
2 16 HG       95    .010   10.92     330    10.939    9626         8      16      95    .077      .6        1    7.3    13    16.0
3 10 HG       98    .010   11.79     300    11.810   14107        12      24     119    .147     1.7        4   17.5    40    10.0
4 16 HG       52    .010   10.92     315    10.936    9626         5      16      91    .077      .3        1    7.0    13    16.0
5 19 HG       90    .010   13.00     145    13.019    7167         5      11      27    .057      .3        1    1.6     1    19.0
6 16 HG       41    .010   10.92     310    10.934    9626         4      16      90    .077      .3        1    6.9    13    16.0
7  3 HG      102    .140   14.19    1225    14.350   24676        18     487     724    .113     2.0       55   82.4   113     3.0
8 16 HG       42    .010   11.04     160    11.056    9626         4      17      46    .077      .3        1    3.5    13    16.0
9 C.T.       544    .010    9.55      40     9.614    2495        14       5       3    .143     2.0        1     .5     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------   .6        3    5.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   .5        4    5.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------   .6        3    5.7
FOUR CYCLE COMPOSITE =                   HC= FID  0.35(     .5) + 0.65(     .6) =     .538    GM/BHP HR
                                         CO= NDIR 0.35(    3.9) + 0.65(    3.1) =    3.373    GM/BHP HR
                                         NO2=CL   0.35(    5.3) + 0.65(    5.7) =    5.533    GM/BHP HR
                                                           CORRECTED NO2 =    5.838    GM/BHP HR
                                                                    BSFC =     .922    LB/BHP HR
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                         TABLE G-34. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-OP  TEST 124 RUN 2  [illegible],EGR 10, 12 BTDC 10-26-73      H [illegible]      HUM =101.5  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR           MAN.
MODE          HC     CO     CO2      NO     CARBON   CONS.      HC      CO      NO2    FACT.    HC      CO    NO2    HP    VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE        22   .140   10.87      25    11.093    2087      16      53        5    .232    3.6      12    1.1     0    17.4
2 16 HG       32   .080   10.81     274    10.925    9889      31     146       82    .077    2.4      11    6.3    19    16.0
3 10 HG       33   .080   11.91     329    12.026   13926      41     187      146    .147    6.1      28   21.4    43    10.0
4 16 HG       30   .070   10.96     344    11.062    9889      24     126      105    .077    2.2      10    8.1    19    10.0
5 19 HG       27   .070   13.55     299    13.649    7257      16      75       53    .057     .9       4    3.0     5    19.0
6 16 HG       28   .070   10.90     352    11.000    9889      27     127      105    .077    2.1      10    8.1    19    16.0
7  3 HG       35   .360   14.19     988    14.608   24358      63    1280      547    .113    7.1     145   61.8   105     3.0
8 16 HG       25   .070   10.98     391    11.077    9889      26     126      116    .077    1.9      10    8.9    19    16.0
9 C.T.       132   .080   11.09      88    11.263    2359      30      34        6    .143    4.3       5     .9     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.2      10    4.9
1 IDLE        22   .140   10.87      25    11.093    2087      16      53        5    .232    3.6      12    1.1     0    17.4
2 16 HG       32   .070   10.90     312    11.005    9889      31     127       93    .077    2.4      10    7.2    19    16.0
3 10 HG       34   .070   11.94     341    12.047   13926      42     163      131    .147    6.2      24   19.2    43    10.0
4 16 HG       29   .070   10.95     329    11.051    9889      28     127      113    .077    2.2      10    8.7    19    10.0
5 19 HG       31   .060   13.58     240    13.673    7257      18      64       42    .057    1.0       4    2.4     5    19.0
6 16 HG       30   .060   10.96     308    11.052    9889      29     108       91    .077    2.2       8    7.0    19    16.0
7  3 HG       32   .330   14.17    1136    14.540   24358      67    1117      632    .113    7.6     126   71.4   105     3.0
8 16 HG       27   .060   11.10     429    11.189    9889      26     107      126    .077    2.0       8    9.7    19    16.0
9 C.T.       119   .020   11.00      80    11.199    2359      27      30        6    .143    3.9       4     .8     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.3       8    5.2
1 IDLE        57   .150   11.37      56    11.582    2087      11      55        3    .232    2.6      13     .6     0    17.4
2 16 HG       32   .070   10.89     305    10.995    9889      31     127       91    .077    2.4      10    7.0    19    16.0
3 10 HG       35   .080   12.05     369    12.168   13926      43     185      140    .147    6.4      27   20.6    43    10.0
4 16 HG       32   .060   10.85     502    10.945    9889      31     110      151    .077    2.4       8   11.6    19    10.0
5 19 HG       30   .060   13.51     240    13.602    7257      17      65       43    .057    1.0       4    2.4     5    19.0
6 16 HG       28   .070   10.88     411    10.980    9889      27     127      123    .077    2.1      10    9.5    19    16.0
7  3 HG       36   .290   14.13    1211    14.459   24358      65     987      677    .113    7.4     112   76.5   105     3.0
8 16 HG       34   .070   11.09     516    11.197    9889      32     125      151    .077    2.5      10   11.7    19    16.0
9 C.T.       124   .020   11.23      80    11.434    2359      28      29        5    .143    4.0       4     .8     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.2       8    5.7
1 IDLE        57   .150   11.37      56    11.582    2087      11      55        3    .232    2.6      13     .8     0    17.4
2 16 HG       33   .070   10.97     310    11.076    9889      32     126       92    .077    2.5      10    7.1    19    16.0
3 10 HG       34   .070   11.96     363    12.066   13926      41     163      139    .147    6.0      24   20.4    43    10.0
4 16 HG       30   .070   11.02     388    11.122    9889      29     126      115    .077    2.2      10    8.8    19    10.0
5 19 HG       32   .070   13.54     240    13.695    7257      18      75       42    .057    1.0       4    2.4     5    19.0
6 16 HG       31   .060   11.02     392    11.113    9889      30     108      116    .077    2.3       8    8.9    19    16.0
7  3 HG       32   .290   14.17    1144    14.500   24358      67     984      638    .113    7.6     111   72.1   105     3.0
8 16 HG       31   .060   11.09     438    11.183    9889      30     107      129    .077    2.3       8    9.9    19    16.0
9 C.T.       122   .020   10.90      71    11.102    2359      28      30        5    .143    4.0       4     .7     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------     1.2       8    5.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------     1.3       9    5.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------     1.2       8    5.5
FOUR CYCLE COMPOSITE =
                                  HC= NDIR 0.35(     1.3) + 0.65(     1.2) =    1.250   GM/BHP HR
                                  CO= NDIR 0.35(     9.0) + 0.65(     7.9) =    8.300   GM/BHP HR
                                  NO2=NDIR 0.35(     5.0) + 0.65(     5.5) =    5.366   GM/BHP HR
                                                        CORRECTED NO2 =    5.237   GM/BHP HR
                                                                 BSFC =     .816   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR        WT.         WEIGHTED GM/HR             MAN.
MODE        HC-FID    CO     CO2   NO-CL    CARBON   CONS.      HC      CO      NO2    FACT.  HC-FID    CO  NO2-CL    HP    VAC.
--------------------------------------------------------------------------------------------------------------------------
1 IDLE       654   .140   10.87      55    11.075    2087      12      53        3    .232    2.4      12     .6     0    17.4
2 16 HG       97   .080   10.81     260    10.400    9889       9     147       78    .077     .7      11    6.0    19    16.0
3 10 HG      126   .080   11.91     365    12.003   13926      15     187      141    .147    2.1      28   20.7    43    10.0
4 16 HG       69   .070   10.96     335    11.037    9889       6     127      100    .077     .5      10    7.7    19    10.0
5 19 HG       35   .070   13.55     285    13.623    7257       2      75       50    .057     .1       4    2.9     5    19.0
6 16 HG       62   .070   10.90     345    10.976    9889       6     127      103    .077     .5      10    7.9    19    16.0
7  3 HG      199   .380   14.14     912    14.890   24358      33    1282      506    .113    3.7     145   57.1   105     3.0
8 16 HG       55   .070   10.98     387    11.056    9889       5     126      115    .077     .4      10    8.8    19    16.0
9 C.T.      1103   .080   11.04      36    11.230    2359      23      34        3    .143    3.3       5     .4     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .6      10    4.9
1 IDLE       654   .140   10.87      55    11.075    2087      12      53        3    .232    2.9      12     .8     0    17.4
2 16 HG       83   .070   10.90     300    10.978    9889       7     127       90    .077     .6      10    6.9    19    16.0
3 10 HG      108   .070   11.94     335    12.021   13926      12     164      129    .147    1.8      24   18.4    43    10.0
4 16 HG       58   .070   10.95     365    11.026    9889       5     127      109    .077     .4      10    8.4    19    10.0
5 19 HG       35   .060   13.58     215    13.643    7257       2      64       38    .057     .1       4    2.2     5    19.0
6 16 HG       55   .060   10.96     305    11.026    9889       5     109       91    .077     .4       8    7.0    19    16.0
7  3 HG      185   .330   14.17    1038    14.518   24358      31    1118      578    .113    3.5     126   65.3   105     3.0
8 16 HG       49   .060   11.10     425    11.165    9889       4     107      128    .077     .3       8    9.6    19    16.0
9 C.T.       937   .020   11.00      36    11.164    2359      20      30        3    .143    2.8       4     .4     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .5       8    4.4
1 IDLE       374   .150   11.37      31    11.557    2087       7      55        2    .232    1.6      13     .4     0    17.4
2 16 HG       69   .070   10.89     280    10.967    9889       6     128       84    .077     .5      10    6.5    19    16.0
3 10 HG      105   .080   12.05     350    12.190   13926      12     186      133    .147    1.8      27   19.6    43    10.0
4 16 HG       62   .060   10.85     450    10.916    9889       6     110      135    .077     .4       8   10.4    19    10.0
5 19 HG       35   .060   13.51     210    13.579    7257       2      65       37    .057     .1       4    2.1     5    19.0
6 16 HG       48   .070   10.88     405    10.955    9889       4     128      121    .077     .3      10    9.3    19    16.0
7  3 HG      152   .290   14.13    1125    14.435   24358      26     988      630    .113    2.9     112   71.2   105     3.0
8 16 HG       89   .070   11.09     500    11.169    9889       9     125      147    .077     .6      10   11.3    19    16.0
9 C.T.       966   .020   11.23      30    11.397    2359      20      29        2    .143    2.9       4     .3     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .5       8    5.3
1 IDLE       374   .150   11.37      31    11.557    2087       7      55        2    .232    1.6      13     .4     0    17.4
2 16 HG       83   .070   10.97     300    11.048    9889       7     127       89    .077     .6      10    6.9    19    16.0
3 10 HG      119   .070   11.96     350    12.042   13926      14     164      134    .147    2.0      24   19.6    43    10.0
4 16 HG       55   .070   11.02     390    11.096    9889       5     126      115    .077     .4      10    8.9    19    10.0
5 19 HG       35   .070   13.59     220    13.663    7257       2      75       39    .057     .1       4    2.2     5    19.0
6 16 HG       55   .060   11.02     400    11.086    9889       5     108      118    .077     .4       8    9.1    19    16.0
7  3 HG      198   .290   14.17    1100    14.480   24358      33     985      614    .113    3.8     111   69.4   105     3.0
8 16 HG       62   .060   11.09     450    11.158    9889       5     107      132    .077     .4       8   10.2    19    16.0
9 C.T.       951   .020   10.90      31    11.065    2359      20      30        2    .143    2.9       4     .3     0    24.8
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------      .5       8    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------      .5       9    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------      .5       8    5.3
FOUR CYCLE COMPOSITE =
                                  HC= FID  0.35(      .5) + 0.65(      .5) =     .499   GM/BHP HR
                                  CO= NDIR 0.35(     9.0) + 0.65(     7.9) =    8.315   GM/BHP HR
                                  NO2=CL   0.35(     4.7) + 0.65(     5.3) =    5.077   GM/BHP HR
                                                        CORRECTED NO2 =    4.957   GM/BHP HR
                                                                 BSFC =     .816   LB/BHP HR
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                  TABLE G-35. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP   TEST 129 RUN 1   NOCAT,EGR 10, 4 STOC   10-26-73      K =1.051     HUM = 93.5  GR/LB
-----------------------------------------------------------------------------------------------------------
           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR            MAN.
MODE        HC     CO    CO2     NO     CARBON   CONS.      HC     CO     NO2    FACT.    HC      CO    NO2    HP     VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE      61   .190  10.33     61    10.536    2495      16     67      5    .232     3.6     16    1.1     0    16.8
2 16 HG     31   .060  11.02    168    11.113    9163      28    100     44    .077     2.1      8    3.4    11    16.0
3 10 HG     29   .060  11.93    219    12.021   14243      37    144     84    .147     5.5     21   12.4    13    10.0
4 16 HG     26   .060  10.90    207    10.988    9163      23    101     57    .077     1.8      8    4.4    10    16.0
5 19 HG     24   .060  13.38    189    13.476    6895      13     62     32    .057      .8      4    1.8     0    19.0
6 16 HG     26   .050  10.84    170    10.918    9163      24     85     47    .077     1.8      7    3.6    10    16.0
7  3 HG     27   .240  14.33    783    14.588   24494      49    819    436    .113     5.5     92   49.3    46     4.0
8 16 HG     25   .050  11.02    230    11.097    9163      22     83     63    .077     1.7      6    4.9    11    15.0
9 C.T.      95   .070  10.93     67    11.103    2586      24     33      5    .143     3.4      5     .7     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------     1.4      9    4.4
1 IDLE      61   .190  11.33     61    11.536    2495      14     61      4    .232     3.3     14    1.0     0    16.8
2 16 HG     30   .050  10.89    188    10.972    9163      27     84     52    .077     2.1      6    4.0    10    16.0
3 10 HG     31   .050  11.86    171    11.943   14243      40    120     68    .147     5.8     18   10.0    13    10.0
4 16 HG     27   .040  10.93    205    10.999    9163      24     67     57    .077     1.8      5    4.4    10    16.0
5 19 HG     27   .050  13.62    169    13.698    6895      15     51     28    .057      .9      3    1.6     0    19.0
6 16 HG     28   .050  10.96    185    11.040    9163      25     84     51    .077     1.9      6    3.9    10    16.0
7  3 HG     28   .220  14.34    779    14.590   24494      51    746    434    .113     5.7     84   49.1    46     4.0
8 16 HG     26   .030  11.07    211    11.128    9163      23     50     58    .077     1.8      4    4.4    11    15.0
9 C.T.      90   .050  10.90     56    11.047    2586      23     24      4    .143     3.3      3     .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------     1.4      8    4.2
1 IDLE     102   .110   9.97     44    10.190    2495      27     54      4    .232     6.3     13     .8     0    16.4
2 16 HG     31   .040  10.88    189    10.953    9163      28     68     55    .077     2.2      5    4.3    11    15.0
3 10 HG     31   .040  11.79    197    11.863   14243      40     97     79    .147     5.9     14   11.5    13    10.0
4 16 HG     28   .040  10.90    191    10.970    9163      25     67     53    .077     1.9      5    4.1    10    16.0
5 19 HG     32   .040  12.96    150    13.025    6895      18     43     26    .057     1.0      3    1.5     0    19.0
6 16 HG     28   .040  10.74    179    10.810    9163      26     68     49    .077     2.0      5    3.8    10    16.0
7  3 HG     30   .160  14.29    916    14.482   24494      55    547    514    .113     6.2     62   58.1    46     4.0
8 16 HG     32   .050  10.37    185    10.455    9163      30     89     54    .077     2.3      7    4.1    11    16.0
9 C.T.      78   .050   8.66     43     8.784    2586      25     30      4    .143     3.5      4     .6     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------     1.7      6    4.8
1 IDLE     102   .110   9.97     44    10.190    2495      27     54      4    .232     6.3     13     .8     0    16.2
2 16 HG     31   .050  10.90    183    10.983    9163      28     84     51    .077     2.2      6    3.9    11    16.0
3 10 HG     30   .050  11.86    194    11.942   14243      39    120     77    .147     5.7     18   11.3    13    10.0
4 16 HG     27   .050  10.91    201    10.989    9163      24     84     56    .077     1.9      6    4.3    11    16.0
5 19 HG     28   .050  13.32    169    13.400    6895      16     52     29    .057      .9      3    1.7     0    19.0
6 16 HG     27   .050  10.86    176    10.929    9163      24     85     49    .077     1.9      7    3.8    10    16.0
7  3 HG     28   .210  14.32    826    14.560   24494      51    719    461    .113     5.7     81   52.1    46     4.0
8 16 HG     28   .040  10.82    209    10.890    9163      25     68     58    .077     2.0      5    4.5    11    15.0
9 C.T.      88   .060  10.16     55    10.315    2586      24     30      5    .143     3.4      4     .7     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------     1.6      8    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------     1.4      8    4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------     1.6      7    4.6
FOUR CYCLE COMPOSITE -                 HC= NDIR 0.35(   1.4) + 0.65(   1.6) =   1.563   GM/BHP HR
                                       CO= NDIR 0.35(   8.3) + 0.65(   7.0) =   7.452   GM/BHP HR
                                       NO2=NDIR 0.35(   4.3) + 0.65(   4.6) =   4.503   GM/BHP HR
                                                           CORRECTED NO2 =   4.734   GM/BHP HR
                                                                    BSFC =   1.067   LB/BHP HR


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           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE       HC-FID   CO    CO2   NO-CL   CARBON   CONS.      HC     CO     NO2    FACT.  HC-FID    CO   NO2-CL  HP     VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE     494   .190  10.33     53    10.519    2495      12     67      4    .232     2.7     16    1.0     0    16.8
2 16 HG     55   .060  11.02    130    11.086    9163       5    100     36    .077      .4      8    2.7    11    16.0
3 10 HG     70   .060  11.93    180    11.997   14243       8    144     71    .147     1.2     21   10.4    13    10.0
4 16 HG     34   .060  10.90    200    10.963    9163       3    101     55    .077      .2      8    4.2    10    16.0
5 19 HG     28   .060  13.39    165    13.453    6895       1     62     28    .057      .1      4    1.6     0    19.0
6 16 HG     28   .050  10.84    170    10.893    9163       2     85     47    .077      .2      7    3.7    10    16.0
7  3 HG     64   .240  14.32    725    14.566   24494      11    815    405    .113     1.2     92   45.7    46     4.0
8 16 HG     34   .050  11.02    225    11.073    9163       3     84     62    .077      .2      6    4.8    10    16.0
9 C.T.     689   .070  10.93     33    11.068    2586      16     33      3    .143     2.3      5     .4     0    24.1
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------      .5      9    4.0
1 IDLE     498   .190  11.33     53    11.520    2495      11     61      4    .232     2.5     14     .9     0    16.9
2 16 HG     52   .050  10.89    160    10.946    9163       4     85     44    .077      .3      7    3.4    11    16.0
3 10 HG     65   .050  11.86    180    11.917   14243       8    121     71    .147     1.2     18   10.5    13    10.0
4 16 HG     39   .040  10.93    200    10.973    9163       3     67     55    .077      .2      5    4.3    10    16.0
5 19 HG     28   .050  13.62    140    13.673    6895       1     51     23    .057      .1      3    1.3     0    19.0
6 16 HG     28   .050  10.96    180    11.013    9163       2     84     50    .077      .2      6    3.9    10    16.0
7  3 HG     67   .220  14.34    730    14.566   24494      10    742    402    .113     1.1     84   45.4    46     4.0
8 16 HG     28   .030  11.07    200    11.103    9163       2     50     55    .077      .2      4    4.2    11    15.0
9 C.T.     703   .050  10.90     26    11.020    2586      16     24      2    .143     2.3      3     .3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------      .4      8    4.0
1 IDLE    1029   .110   9.97     20    10.182    2495      25     54      2    .232     5.8     13     .4     0    16.4
2 16 HG     52   .040  10.88    180    10.925    9163       4     68     50    .077      .3      5    3.9    11    15.0
3 10 HG     62   .040  11.79    190    11.836   14243       7     97     72    .147     1.1     14   10.6    13    10.0
4 16 HG     37   .040  10.90    180    10.944    9163       3     68     50    .077      .2      5    3.9    11    16.0
5 19 HG     71   .040  12.96    180    12.997    6895       4     43     21    .057      .2      2    1.2     0    19.0
6 16 HG     82   .040  10.74    170    10.788    9163       7     69     48    .077      .5      5    3.7    10    16.0
7  3 HG     57   .160  14.29    860    14.456   24494      10    548    484    .113     1.1     62   54.7    46     4.0
8 16 HG     61   .050  10.37    170    10.426    9163       5     88     50    .077      .4      7    3.8    11    16.0
9 C.T.     567   .050   8.66     21     8.757    2586      17     30      2    .143     2.4      4     .3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------      .7      6    4.4
1 IDLE    1029   .110   9.97     20    10.182    2495      25     54      2    .232     5.8     13     .4     0    16.4
2 16 HG     53   .050  10.90    157    10.956    9163       4     84     44    .077      .3      7    3.4    11    16.0
3 10 HG     65   .050  11.86    180    11.917   14243       8    121     71    .147     1.2     18   10.5    13    10.0
4 16 HG     35   .050  10.91    193    10.964    9163       3     84     54    .077      .2      6    4.1    11    16.0
5 19 HG     43   .050  13.32    142    13.374    6895       2     52     24    .057      .1      3    1.4     0    19.0
6 16 HG     46   .050  10.86    173    10.905    9163       4     85     48    .077      .3      7    3.7    10    16.0
7  3 HG     50   .210  14.32    768    14.535   24494       8    715    430    .113     1.0     81   48.6    46     4.0
8 16 HG     55   .040  10.82    198    10.866    9163       5     68     55    .077      .4      5    4.2    11    16.0
9 C.T.     652   .060  10.16     23    10.285    2586      16     30      2    .143     2.3      4     .3     0    24.2
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------      .6      8    4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------      .4      8    4.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------      .6      7    4.3
FOUR CYCLE COMPOSITE -                 HC= FID  0.35(    .4) + 0.65(    .6) =    .530   GM/BHP HR
                                       CO= NDIR 0.35(   8.3) + 0.65(   7.0) =   7.466   GM/BHP HR
                                       NO2=CL   0.35(   4.0) + 0.65(   4.3) =   4.165   GM/BHP HR
                                                           CORRECTED NO2 =   4.379   GM/BHP HR
                                                                    BSFC =   1.067   LB/BHP HR
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                     TABLE G-36. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-UP TEST 130 RUN3 0-CAT EGR 10 12BTDC 67JET810-26-73     K =1.028     HUM = 84.3  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR              MAN.
MODE          HC      CO    CO2      NO  CARBON   CONS.       HC      CO     NO2   FACT.    HC       CO    NO2    HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE        89    .070  10.56      85  10.726    2087       19      28       5   .232    4.3        6    1.3     0    17.4
2 16 MG       28    .010  11.41     385  11.450   10251       27      18     114   .077    2.1        1    8.8    20    16.0
3 10 MG       23    .020  12.59     399  12.635   15105       30      48     158   .147    4.4        7   23.3    49    10.0
4 16 MG       24    .080  11.53     399  11.636   10251       23     142     117   .077    1.8       11    9.0    20    16.0
5 19 MG       18    .080  14.03     371  14.129    6985       10      80      61   .057     .5        5    3.5     5    19.0
6 16 MG       23    .080  11.53     330  11.635   10251       22     142      97   .077    1.7       11    7.4    20    16.0
7  3 MG       33    .590  14.18     659  14.806   24857       60    2001     367   .113    6.8      226   41.5   104     3.0
8 16 MG       18    .040  11.79     371  11.849   10251       17      70     107   .077    1.3        5    8.2    20    16.0
9 C.T.       112    .110  10.33      72  10.561    2223       25      47       5   .143    3.6        7     .7     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.0       11    4.1
1 IDLE        89    .070  10.56      85  10.726    2087       19      28       5   .232    4.3        6    1.3     0    17.4
2 16 MG       28    .080  11.66     385  11.770   10251       26     141     111   .077    2.0       11    8.6    20    16.0
3 10 MG       23    .020  12.59     357  12.635   15105       30      48     142   .147    4.4        7   20.8    49    10.0
4 16 MG       23    .080  11.66     344  11.765   10251       22     141     100   .077    1.7       11    7.7    20    16.0
5 19 MG       18    .080  14.03     330  14.129    6985       10      80      54   .057     .5        5    3.1     5    19.0
6 16 MG       24    .010  11.66     344  11.696   10251       23      18     100   .077    1.7        1    7.7    20    16.0
7  3 MG       37    .460  14.18     751  14.680   24857       68    1573     422   .113    7.6      178   47.7   104     3.0
8 16 MG       18    .080  11.53     385  11.629   10251       17     142     113   .077    1.3       11    8.7    20    16.0
9 C.T.       107    .080  10.33      60  10.526    2223       24      34       4   .143    3.5        5     .6     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.1        9    4.2
1 IDLE        56    .110  11.41      61  11.580    2087       11      40       4   .232    2.5        9     .8     0    17.4
2 16 MG       23    .010  11.53     399  11.565   10251       22      18     117   .077    1.7        1    9.0    20    16.0
3 10 MG       23    .020  12.59     357  12.635   15105       30      48     142   .147    4.4        7   20.8    49    10.0
4 16 MG       23    .080  11.66     330  11.765   10251       22     141      95   .077    1.7       11    7.4    20    16.0
5 19 MG       23    .080  14.18     303  14.285    6985       12      79      49   .057     .7        5    2.8     5    19.0
6 16 MG       27    .080  11.53     344  11.639   10251       26     142     101   .077    2.0       11    7.7    20    16.0
7  3 MG       33    .400  14.18     862  14.616   24857       61    1374     487   .113    6.8      155   55.0   104     3.0
8 16 MG       19    .080  11.66     385  11.761   10251       18     141     111   .077    1.4       11    8.6    20    16.0
9 C.T.       122    .080  10.68      61  10.892    2223       27      33       4   .143    3.8        5     .6     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.0        8    4.4
1 IDLE        56    .110  11.41      61  11.580    2087       11      40       4   .232    2.5        9     .8     0    17.4
2 16 MG       28    .010  11.53     399  11.570   10251       27      18     117   .077    2.1        1    9.0    20    16.0
3 10 MG       23    .010  12.59     357  12.625   15105       30      24     142   .147    4.4        4   20.8    49    10.0
4 16 MG       23    .020  11.66     330  11.705   10251       22      35      96   .077    1.7        3    7.4    20    16.0
5 19 MG       23    .010  14.18     303  14.215    6985       12      10      49   .057     .7        1    2.8     5    19.0
6 16 MG       20    .010  11.53     344  11.562   10251       19      18     101   .077    1.5        1    7.8    20    16.0
7  3 MG       47    .320  14.28     862  14.651   24857       86    1097     486   .113    9.7      124   54.9   104     3.0
8 16 MG       19    .080  11.53     399  11.631   10251       18     142     117   .077    1.4       11    9.0    20    16.0
9 C.T.       122    .080  10.80      61  11.012    2223       27      33       4   .143    3.8        5     .6     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------    1.1        6    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------    1.1       10    4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------    1.0        7    4.4
FOUR CYCLE COMPOSITE -                        HC- NDIR 0.35(     1.1) + 0.65(     1.0) =    1.039   GM/BHP HR
                                              CO- NDIR 0.35(    10.1) + 0.65(     7.3) =    8.278   GM/BHP HR
                                              NO2-NDIR 0.35(     4.1) + 0.65(     4.4) =    4.315   GM/BHP HR
                                                                 CORRECTED NO2 =    4.433   GM/BHP HR
                                                                          BSFC =     .811   LB/BHP HR
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR         WT.      WEIGHTED GM/HR              MAN.
MODE      HC-FID      CO    CO2   NO-CL  CARBON   CONS.       HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL   HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE       741    .070  10.56      60  10.704    2087       14      28       4   .232    3.4        6     .9     0    17.4
2 16 MG       86    .010  11.41     225  11.429   10251        8      18      67   .077     .6        1    5.2    20    16.0
3 10 MG      121    .020  12.59     480  12.622   15105       14      48     191   .147    2.1        7   28.0    49    10.0
4 16 MG       55    .080  11.53     350  11.616   10251        5     143     103   .077     .4       11    7.9    20    16.0
5 19 MG       57    .080  14.03     350  14.116    6985        3      80      58   .057     .2        5    3.3     5    19.0
6 16 MG       50    .080  11.53     305  11.615   10251        4     143      89   .077     .3       11    6.9    20    16.0
7  3 MG      170    .590  14.18     575  14.787   24857       29    2003     321   .113    3.2      226   36.3   104     3.0
8 16 MG       37    .040  11.79     330  11.834   10251        3      70      95   .077     .2        5    7.3    20    16.0
9 C.T.       919    .110  10.33      35  10.532    2223       19      47       2   .143    2.8        7     .4     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .5       11    3.8
1 IDLE       741    .070  10.56      60  10.704    2087       14      28       4   .232    3.4        6     .9     0    17.4
2 16 MG       83    .080  11.66     245  11.748   10251        7     141      71   .077     .6       11    5.5    20    16.0
3 10 MG       94    .020  12.59     430  12.619   15105       11      48     171   .147    1.7        7   25.1    49    10.0
4 16 MG       49    .080  11.66     320  11.745   10251        4     141      93   .077     .3       11    7.1    20    16.0
5 19 MG       67    .080  14.03     275  14.117    6985        3      80      45   .057     .2        5    2.6     5    19.0
6 16 MG       47    .010  11.66     310  11.675   10251        4      18      90   .077     .3        1    7.0    20    16.0
7  3 MG      156    .460  14.18     570  14.656   24857       26    1576     321   .113    3.0      178   36.3   104     3.0
8 16 MG       34    .080  11.53     350  11.613   10251        3     143     103   .077     .2       11    7.9    20    16.0
9 C.T.       795    .080  10.33      35  10.489    2223       17      34       2   .143    2.4        5     .4     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .5        9    3.6
1 IDLE       387    .110  11.41      35  11.559    2087        7      40       2   .232    1.6        9     .5     0    17.4
2 16 MG       71    .010  11.53     260  11.547   10251        6      18      77   .077     .5        1    5.9    20    16.0
3 10 MG       90    .020  12.59     430  12.619   15105       11      48     171   .147    1.6        7   25.1    49    10.0
4 16 MG       45    .080  11.66     340  11.745   10251        4     141      99   .077     .3       11    7.6    20    16.0
5 19 MG       60    .080  14.18     270  14.266    6985        3      79      44   .057     .2        5    2.5     5    19.0
6 16 MG       45    .080  11.53     325  11.615   10251        4     143      95   .077     .3       11    7.3    20    16.0
7  3 MG      146    .400  14.18     750  14.595   24857       25    1376     424   .113    2.8      156   47.9   104     3.0
8 16 MG       33    .080  11.66     350  11.743   10251        3     141     101   .077     .2       11    7.8    20    16.0
9 C.T.      1031    .080  10.68      35  10.863    2223       21      33       2   .143    3.0        5     .3     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .4        8    4.1
1 IDLE       387    .110  11.41      35  11.559    2087        7      40       2   .232    1.6        9     .5     0    17.4
2 16 MG       72    .010  11.53     270  11.547   10251        6      18      80   .077     .5        1    6.1    20    16.0
3 10 MG       87    .010  12.59     435  12.609   15105       10      24     173   .147    1.5        4   25.4    49    10.0
4 16 MG       49    .020  11.66     335  11.685   10251        4      35      98   .077     .3        3    7.5    20    16.0
5 19 MG       66    .010  14.18     280  14.197    6985        3      10      46   .057     .2        1    2.6     5    19.0
6 16 MG       46    .010  11.53     330  11.545   10251        4      18      97   .077     .3        1    7.5    20    16.0
7  3 MG      131    .320  14.28     840  14.613   24857       22    1100     474   .113    2.5      124   53.6   104     3.0
8 16 MG       34    .080  11.53     360  11.613   10251        3     143     105   .077     .2       11    8.1    20    16.0
9 C.T.      1060    .080  10.80      35  10.986    2223       21      33       2   .143    3.1        5     .3     0    24.6
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------     .4        6    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     .5       10    3.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     .4        7    4.2
FOUR CYCLE COMPOSITE -                        HC- FID  0.35(      .5) + 0.65(      .4) =     .438   GM/BHP HR
                                              CO- NDIR 0.35(    10.1) + 0.65(     7.3) =    8.292   GM/BHP HR
                                              NO2-CL   0.35(     3.7) + 0.65(     4.2) =    4.053   GM/BHP HR
                                                                 CORRECTED NO2 =    4.164   GM/BHP HR
                                                                          BSFC =     .811   LB/BHP HR
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TABLE G-37. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-OP TEST 130 RUN 2 0-CAT,EGR 10 BBTDC 67JETS10-26-73 K =1.016 HUM = 80.3 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	50	.160	10.83	73	11.044	2041	10	60	4	.232	2.3	14	1.0	0	16.9
2 16 MG	24	.090	11.34	210	11.456	10206	23	162	62	.077	1.8	12	4.6	16	16.0
3 10 MG	23	.090	12.34	308	12.455	14787	29	216	121	.147	4.3	32	17.8	43	10.0
4 16 MG	23	.080	11.22	264	11.325	10206	22	146	79	.077	1.7	11	6.1	16	16.0
5 19 MG	19	.070	13.92	258	14.011	6849	10	69	42	.057	.6	4	2.4	1	19.0
6 16 MG	20	.070	11.28	234	11.372	10206	19	127	70	.077	1.5	10	5.4	16	16.0
7 3 MG	22	.390	14.20	677	14.614	25084	41	1352	386	.113	4.6	153	43.6	101	3.0
8 16 MG	21	.050	11.53	277	11.603	10206	20	89	81	.077	1.5	7	6.2	16	16.0
9 C.T.	108	.060	10.78	76	10.957	2268	24	25	5	.143	3.5	4	.7	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											1.0	11	3.4		
1 IDLE	50	.160	10.83	73	11.044	2041	10	60	4	.232	2.3	14	1.0	0	16.9
2 16 MG	24	.040	11.46	225	11.526	10206	23	72	66	.077	1.8	6	5.1	16	16.0
3 10 MG	23	.060	12.53	327	12.615	14787	29	142	127	.147	4.3	21	18.7	43	10.0
4 16 MG	22	.050	11.50	247	11.574	10206	21	89	72	.077	1.6	7	5.6	16	16.0
5 19 MG	24	.060	14.02	209	14.106	6849	13	59	34	.057	.7	3	1.9	1	19.0
6 16 MG	20	.060	11.40	244	11.482	10206	19	108	72	.077	1.5	8	5.5	16	16.0
7 3 MG	23	.370	14.26	681	14.655	25084	43	1279	387	.113	4.8	145	43.7	101	3.0
8 16 MG	22	.050	11.41	285	11.484	10206	21	90	84	.077	1.6	7	6.5	16	16.0
9 C.T.	84	.060	10.67	70	10.821	2268	19	25	5	.143	2.7	4	.7	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.9	9	3.4		
1 IDLE	46	.120	11.34	67	11.510	2041	9	43	4	.232	2.0	10	.9	0	16.9
2 16 MG	21	.060	11.56	269	11.643	10206	20	106	78	.077	1.5	8	6.0	16	16.0
3 10 MG	20	.070	12.43	317	12.522	14787	26	167	124	.147	3.7	25	18.3	43	10.0
4 16 MG	21	.050	11.51	251	11.583	10206	20	89	73	.077	1.5	7	5.7	16	16.0
5 19 MG	24	.060	14.06	213	14.146	6849	13	59	34	.057	.7	3	2.0	1	19.0
6 16 MG	20	.050	11.35	250	11.422	10206	19	90	74	.077	1.5	7	5.7	16	16.0
7 3 MG	24	.370	14.32	724	14.716	25084	44	1274	410	.113	5.0	144	46.3	101	3.0
8 16 MG	20	.040	11.62	277	11.682	10206	19	71	80	.077	1.5	5	6.2	16	16.0
9 C.T.	84	.040	10.69	66	10.821	2268	19	17	5	.143	2.7	2	.7	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.9	9	4.0		
1 IDLE	46	.120	11.34	67	11.510	2041	9	43	4	.232	2.0	10	.9	0	16.9
2 16 MG	25	.040	11.59	265	11.657	10206	24	71	77	.077	1.8	5	5.9	16	16.0
3 10 MG	25	.040	12.47	337	12.537	14787	32	95	132	.147	4.7	14	19.4	43	10.0
4 16 MG	24	.070	11.54	244	11.636	10206	23	124	71	.077	1.8	10	5.5	16	16.0
5 19 MG	25	.040	14.02	228	14.087	6849	13	39	37	.057	.7	2	2.1	1	19.0
6 16 MG	20	.040	11.43	254	11.492	10206	19	72	75	.077	1.5	6	5.8	16	16.0
7 3 MG	26	.340	14.23	698	14.598	25084	48	1180	398	.113	5.5	133	45.0	101	3.0
8 16 MG	23	.050	11.56	280	11.635	10206	22	89	82	.077	1.7	7	6.3	16	16.0
9 C.T.	95	.050	10.77	69	10.923	2268	21	21	4	.143	3.0	3	.6	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											1.0	8	4.0		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.9	10	3.4		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.9	9	4.0		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(.9) + 0.65(.9) = .946 GM/BHP HR
CO- NDIR 0.35(10.1) + 0.65(8.8) = 9.289 GM/BHP HR
NO2-NDIR 0.35(3.9) + 0.65(4.0) = 3.982 GM/BHP HR
CORRECTED NO2 = 4.046 GM/BHP HR
BSFC = .906 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	447	.160	10.83	40	11.035	2041	8	60	2	.232	1.9	14	.6	0	16.9
2 16 MG	50	.090	11.34	162	11.435	10206	4	162	48	.077	.3	12	3.7	16	16.0
3 10 MG	69	.090	12.34	320	12.437	14787	8	216	126	.147	1.2	32	18.6	43	10.0
4 16 MG	31	.080	11.22	240	11.303	10206	3	146	72	.077	.2	11	5.5	16	16.0
5 19 MG	37	.070	13.92	232	13.994	6849	2	69	38	.057	.1	4	2.1	1	19.0
6 16 MG	27	.070	11.28	220	11.353	10206	2	127	66	.077	.2	10	5.1	16	16.0
7 3 MG	92	.390	14.20	610	14.599	25084	16	1354	348	.113	1.8	153	39.3	101	3.0
8 16 MG	15	.050	11.53	235	11.582	10206	1	89	69	.077	.1	7	5.3	16	16.0
9 C.T.	840	.060	10.78	45	10.924	2268	17	25	3	.143	2.5	4	.4	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.4	11	3.5		
1 IDLE	447	.160	10.83	40	11.035	2041	8	60	2	.232	1.9	14	.6	0	16.9
2 16 MG	50	.040	11.46	200	11.505	10206	4	72	59	.077	.3	6	4.5	16	16.0
3 10 MG	57	.060	12.53	308	12.596	14787	7	142	120	.147	1.0	21	17.6	43	10.0
4 16 MG	28	.050	11.50	230	11.553	10206	2	89	67	.077	.2	7	5.2	16	16.0
5 19 MG	60	.060	14.02	170	14.086	6849	3	59	27	.057	.2	3	1.6	1	19.0
6 16 MG	25	.060	11.40	230	11.463	10206	2	108	68	.077	.2	8	5.2	16	16.0
7 3 MG	78	.370	14.26	610	14.638	25084	13	1281	347	.113	1.5	145	39.2	101	3.0
8 16 MG	19	.050	11.41	250	11.462	10206	2	90	74	.077	.1	7	5.7	16	16.0
9 C.T.	715	.060	10.67	40	10.801	2268	15	25	3	.143	2.1	4	.4	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.3	9	3.5		
1 IDLE	415	.120	11.34	37	11.501	2041	7	43	2	.232	1.7	10	.5	0	16.9
2 16 MG	45	.060	11.56	210	11.625	10206	4	106	61	.077	.3	8	4.7	16	16.0
3 10 MG	50	.070	12.43	295	12.505	14787	6	167	116	.147	.9	25	17.0	43	10.0
4 16 MG	28	.050	11.51	240	11.563	10206	2	89	70	.077	.2	7	5.4	16	16.0
5 19 MG	43	.060	14.06	170	14.124	6849	2	59	27	.057	.1	3	1.6	1	19.0
6 16 MG	28	.050	11.35	240	11.403	10206	2	90	71	.077	.2	7	5.5	16	16.0
7 3 MG	76	.370	14.32	668	14.698	25084	13	1276	378	.113	1.5	144	42.8	101	3.0
8 16 MG	17	.040	11.62	250	11.662	10206	1	71	73	.077	.1	5	5.6	16	16.0
9 C.T.	687	.040	10.69	38	10.799	2268	14	17	3	.143	2.1	2	.4	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.3	9	3.7		
1 IDLE	415	.120	11.34	37	11.501	2041	7	43	2	.232	1.7	10	.5	0	16.9
2 16 MG	47	.040	11.59	210	11.635	10206	4	71	61	.077	.3	5	4.7	16	16.0
3 10 MG	57	.040	12.47	305	12.516	14787	7	95	120	.147	1.0	14	17.6	43	10.0
4 16 MG	30	.070	11.54	230	11.613	10206	3	124	67	.077	.2	10	5.2	16	16.0
5 19 MG	38	.040	14.02	183	14.064	6849	2	39	30	.057	.1	2	1.7	1	19.0
6 16 MG	28	.040	11.43	230	11.473	10206	2	72	68	.077	.2	6	5.2	16	16.0
7 3 MG	83	.340	14.23	630	14.578	25084	14	1182	360	.113	1.6	134	40.7	101	3.0
8 16 MG	24	.050	11.56	252	11.612	10206	2	89	74	.077	.2	7	5.7	16	16.0
9 C.T.	756	.050	10.77	40	10.896	2268	16	21	3	.143	2.2	3	.4	0	24.4
CYCLE COMPOSITE IN GM/BHP HR											.3	8	3.6		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.4	10	3.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.3	9	3.6		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(.4) + 0.65(.3) = .331 GM/BHP HR
CO- NDIR 0.35(10.1) + 0.65(8.9) = 9.301 GM/BHP HR
NO2-CL 0.35(3.5) + 0.65(3.6) = 3.599 GM/BHP HR
CORRECTED NO2 = 3.657 GM/BHP HR
BSFC = .906 LB/BHP HR

TABLE G-38. MASS EMISSIONS BY NINE-MODE FTP

ENGINE 7-UP TEST 130 RUN 1 0-CAT,EGR 10 4BTDC 67JET810-26-73   K =1.032   HUM = 86.1 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	27	.090	11.20	58	11.319	2313	6	37	4	.232	1.4	9	.9	0	16.6
2 16 MG	21	.030	11.52	189	11.573	10161	20	53	55	.077	1.5	4	4.2	12	16.0
3 10 MG	19	.030	12.54	266	12.591	14969	24	72	105	.147	3.6	11	15.4	39	10.0
4 16 MG	19	.030	11.46	229	11.511	10164	18	54	67	.077	1.4	4	5.2	12	16.0
5 19 MG	15	.060	14.08	219	14.156	7258	8	62	37	.057	.5	4	2.1	0	19.0
6 16 MG	15	.040	11.42	204	11.476	10161	14	72	60	.077	1.1	6	4.6	12	16.0
7 3 MG	16	.380	14.48	565	14.877	25175	29	1299	317	.113	3.3	147	35.8	99	3.0
8 16 MG	16	.050	11.46	215	11.527	10161	15	89	63	.077	1.2	7	4.8	12	16.0
9 C.T.	110	.060	11.33	64	11.509	2409	25	25	4	.143	3.5	4	.6	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.8	9	3.6		
1 IDLE	27	.090	11.20	58	11.319	2313	6	37	4	.232	1.4	9	.9	0	16.6
2 16 MG	19	.050	11.51	201	11.581	10161	18	89	59	.077	1.4	7	4.5	12	16.0
3 10 MG	17	.050	12.64	235	12.708	14969	22	119	92	.147	3.2	17	13.5	39	10.0
4 16 MG	18	.040	11.52	207	11.579	10164	17	71	60	.077	1.3	5	4.6	12	16.0
5 19 MG	15	.040	14.10	210	14.156	7258	8	41	36	.057	.5	2	2.0	0	19.0
6 16 MG	16	.030	11.58	207	11.627	10161	15	53	60	.077	1.2	4	4.6	12	16.0
7 3 MG	16	.340	14.46	545	14.817	25175	29	1167	307	.113	3.3	132	34.7	99	3.0
8 16 MG	18	.020	11.39	225	11.429	10161	17	36	66	.077	1.3	3	5.1	12	16.0
9 C.T.	125	.040	11.56	54	11.735	2409	28	17	4	.143	4.0	2	.5	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.8	9	3.4		
1 IDLE	27	.110	11.33	77	11.469	2313	6	45	5	.232	1.4	10	1.2	0	16.6
2 16 MG	19	.040	11.58	228	11.641	10161	18	71	66	.077	1.4	5	5.1	12	16.0
3 10 MG	19	.040	12.59	253	12.651	14969	24	96	99	.147	3.6	14	14.6	39	10.0
4 16 MG	18	.040	11.55	227	11.609	10164	17	71	66	.077	1.3	5	5.1	12	16.0
5 19 MG	15	.050	14.08	193	14.146	7258	8	52	33	.057	.5	3	1.9	0	19.0
6 16 MG	16	.030	11.48	222	11.527	10161	15	53	65	.077	1.2	4	5.0	12	16.0
7 3 MG	16	.330	14.48	672	14.827	25175	29	1132	379	.113	3.3	128	42.8	99	3.0
8 16 MG	18	.040	11.61	234	11.669	10161	17	70	68	.077	1.3	5	5.2	12	16.0
9 C.T.	97	.060	11.38	54	11.545	2409	22	25	4	.143	3.1	4	.5	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.8	9	3.9		
1 IDLE	27	.110	11.33	77	11.469	2313	6	45	5	.232	1.4	10	1.2	0	16.6
2 16 MG	19	.030	11.50	240	11.551	10161	18	53	70	.077	1.4	4	5.4	12	16.0
3 10 MG	17	.040	12.46	262	12.518	14969	22	97	104	.147	3.2	14	15.3	39	10.0
4 16 MG	18	.040	11.41	234	11.469	10164	17	72	69	.077	1.3	6	5.3	12	16.0
5 19 MG	16	.030	14.00	208	14.047	7258	9	31	36	.057	.5	2	2.0	0	19.0
6 16 MG	16	.020	11.28	228	11.317	10161	16	36	68	.077	1.2	3	5.2	12	16.0
7 3 MG	18	.190	14.40	830	14.609	25175	33	661	475	.113	3.8	75	53.7	99	3.0
8 16 MG	17	.020	11.36	249	11.398	10161	16	36	74	.077	1.3	3	5.7	12	16.0
9 C.T.	84	.030	11.07	66	11.191	2409	19	13	5	.143	2.8	2	.7	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.8	6	4.6		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.8	9	3.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.8	7	4.3		

FOUR CYCLE COMPOSITE -
HC- NDIR 0.35(.8) + 0.65(.8) = .831 GM/BHP HR
CO- NDIR 0.35(9.1) + 0.65(7.2) = 7.878 GM/BHP HR
NO2-NDIR 0.35(3.5) + 0.65(4.3) = 3.999 GM/BHP HR
CORRECTED NO2 = 4.128 GM/BHP HR
BSFC = 1.013 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	193	.090	11.20	25	11.309	2313	4	37	2	.232	.9	9	.4	0	16.6
2 16 MG	33	.030	11.52	140	11.553	10161	3	53	41	.077	.2	4	3.1	12	16.0
3 10 MG	59	.030	12.54	260	12.576	14969	7	72	103	.147	1.0	11	15.1	39	10.0
4 16 MG	37	.030	11.46	200	11.494	10164	3	54	59	.077	.2	4	4.5	12	16.0
5 19 MG	37	.060	14.08	210	14.144	7258	2	62	36	.057	.1	4	2.0	0	19.0
6 16 MG	31	.040	11.42	370	11.463	10161	3	72	109	.077	.2	6	8.4	12	16.0
7 3 MG	75	.380	14.48	530	14.868	25175	13	1300	298	.113	1.4	147	33.7	99	3.0
8 16 MG	28	.050	11.46	200	11.513	10161	2	89	59	.077	.2	7	4.5	12	16.0
9 C.T.	884	.060	11.33	25	11.478	2409	19	25	2	.143	2.6	4	.2	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.3	9	3.5		
1 IDLE	193	.090	11.20	25	11.309	2313	4	37	2	.232	.9	9	.4	0	16.6
2 16 MG	46	.050	11.51	160	11.565	10161	4	89	47	.077	.3	7	3.6	12	16.0
3 10 MG	49	.050	12.64	245	12.695	14969	6	119	96	.147	.9	18	14.1	39	10.0
4 16 MG	31	.040	11.52	190	11.563	10164	3	71	55	.077	.2	5	4.3	12	16.0
5 19 MG	38	.040	14.10	160	14.144	7258	2	41	27	.057	.1	2	1.6	0	19.0
6 16 MG	28	.030	11.58	200	11.613	10161	2	53	58	.077	.2	4	4.5	12	16.0
7 3 MG	57	.340	14.46	610	14.806	25175	10	1168	288	.113	1.1	132	32.5	99	3.0
8 16 MG	24	.020	11.39	210	11.412	10161	2	36	62	.077	.2	3	4.8	12	16.0
9 C.T.	997	.040	11.56	30	11.700	2409	20	17	2	.143	2.9	2	.3	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.3	9	3.2		
1 IDLE	224	.110	11.33	40	11.462	2313	5	45	3	.232	1.1	10	.6	0	16.6
2 16 MG	34	.040	11.58	180	11.623	10161	3	71	52	.077	.2	5	4.0	12	16.0
3 10 MG	41	.040	12.59	260	12.634	14969	5	96	102	.147	.7	14	15.0	39	10.0
4 16 MG	24	.040	11.55	210	11.592	10164	2	71	61	.077	.2	5	4.7	12	16.0
5 19 MG	28	.050	14.08	165	14.133	7258	1	52	28	.057	.1	3	1.6	0	19.0
6 16 MG	25	.030	11.48	200	11.513	10161	2	53	59	.077	.2	4	4.5	12	16.0
7 3 MG	53	.330	14.48	620	14.815	25175	9	1133	350	.113	1.0	128	39.5	99	3.0
8 16 MG	18	.040	11.61	220	11.652	10161	2	70	64	.077	.1	5	4.9	12	16.0
9 C.T.	927	.060	11.38	30	11.533	2409	19	25	2	.143	2.8	4	.3	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.3	9	3.6		
1 IDLE	224	.110	11.33	40	11.462	2313	5	45	3	.232	1.1	10	.6	0	16.6
2 16 MG	22	.030	11.50	180	11.532	10161	2	53	53	.077	.2	4	4.1	12	16.0
3 10 MG	38	.040	12.46	250	12.504	14969	5	97	99	.147	.7	14	14.6	39	10.0
4 16 MG	22	.040	11.41	215	11.452	10164	2	72	63	.077	.2	6	4.9	12	16.0
5 19 MG	19	.030	14.00	170	14.032	7258	1	31	29	.057	.1	2	1.7	0	19.0
6 16 MG	21	.020	11.28	200	11.302	10161	2	36	60	.077	.1	3	4.6	12	16.0
7 3 MG	53	.190	14.40	700	14.595	25175	9	662	401	.113	1.0	75	45.3	99	3.0
8 16 MG	15	.020	11.36	220	11.382	10161	1	36	65	.077	.1	3	5.0	12	16.0
9 C.T.	731	.030	11.07	30	11.173	2409	16	13	2	.143	2.2	2	.3	0	24.2
CYCLE COMPOSITE IN GM/BHP HR											.3	6	3.9		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)											.3	9	3.3		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)											.3	7	3.8		

FOUR CYCLE COMPOSITE -
HC- FID 0.35(.3) + 0.65(.3) = .305 GM/BHP HR
CO- NDIR 0.35(9.1) + 0.65(7.2) = 7.885 GM/BHP HR
NO2-CL 0.35(3.3) + 0.65(3.8) = 3.635 GM/BHP HR
CORRECTED NO2 = 3.753 GM/BHP HR
BSFC = 1.013 LB/BHP HR

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                    TABLE G-39, MASS EMISSIONS BY NINE-MODE FTP
ENGINE 2-1P  TEST 120 RUN-1  W/O CAT-2AIR 703-60PV  10-18-73       K = .903     HUM = 44.9  GR/LB
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                 CONCENTRATION AS MEASURED      TOTAL     FUEL        CALCULATED GM/HR          WT.      WEIGHTED GM/HR             MAN.
MODE             HC       CO     CO2      NO    CARBON    CONS.       HC       CO      NO2    FACT.   HC        CO    NO2    HP     VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE           37     .020    8.02      48     8.080     2177       11       11        4    .232    2.5        3    1.0     0     17.6
2 16 HG          37     .040   10.44     123    10.520    11068       42       85       43    .077    3.2        7    3.3    26     16.0
3 10 HG          37     .080   11.42     251    12.040    17690       59      237      122    .147    8.6       35   18.0    63     10.0
4 16 HG          26     .040   10.56      98    10.630    11068       31       84       34    .077    2.4        6    2.6    26     16.0
5 19 HG          23     .010    8.32      48     8.355     7757       23       19       15    .057    1.3        1     .8     9     19.0
6 16 HG          33     .030   10.44      73    10.506    11068       38       64       26    .077    2.9        5    2.0    26     16.0
7  3 HG          41     .110   12.45     173    12.604    23497       83      414      107    .113    9.3       47   12.1   101      3.0
8 16 HG          27     .040   10.68      73    10.749    10168       29       76       23    .077    2.1        6    1.8    26     16.0
9 C.T.           28     .010    3.87      36     3.910     2404       19       12        7    .143    2.7        2    1.1     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------  1.2        4    1.5
1 IDLE           37     .020    8.02      48     8.080     2177       11       11        4    .232    2.5        3    1.0     0     17.5
2 16 HG          33     .020   10.44      61    10.496    11068       38       43       21    .077    2.9        3    1.6    26     16.0
3 10 HG          37     .070   11.92      98    12.030    17690       59      208       48    .147    8.6       31    7.0    63     10.0
4 16 HG          28     .030   10.56      61    10.620    11068       32       63       21    .077    2.4        5    1.6    26     16.0
5 19 HG          28     .010    8.42      36     8.460     7757       26       17       10    .057    1.5        1     .6     9     19.0
6 16 HG          33     .040   10.56      61    10.636    11068       37       84       21    .077    2.9        6    1.6    26     16.0
7  3 HG          42     .100   12.59     110    12.735    23497       84      373       67    .113    9.5       42    7.6   101      3.0
8 16 HG          28     .040   10.68      61    10.750    10168       29       76       19    .077    2.2        6    1.5    26     16.0
9 C.T.           28     .010    3.94      36     4.030     2404       18       12        7    .143    2.6        2    1.0     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------  1.2        3     .8
1 IDLE           28     .010    8.82      36     8.860     2177        7        5        3    .232    1.7        1     .7     0     17.6
2 16 HG          33     .020   10.56      61    10.616    11068       37       42       21    .077    2.9        3    1.6    26     16.0
3 10 HG          37     .070   12.05      85    12.160    17690       58      206       41    .147    8.5       30    6.0    63     10.0
4 16 HG          33     .030   10.56      48    10.626    11068       37       63       17    .077    2.9        5    1.3    26     16.0
5 19 HG          28     .010    9.02      36     9.060     7757       26       17       10    .057    1.5        1     .6     9     19.0
6 16 HG          33     .030   10.56      61    10.626    11068       37       63       21    .077    2.9        5    1.6    26     16.0
7  3 HG          42     .090   12.45     110    12.585    23497       85      339       68    .113    9.6       38    7.7   101      3.0
8 16 HG          33     .040   10.68      48    10.756    10168       34       76       15    .077    2.6        6    1.2    26     16.0
9 C.T.           28     .010    3.87      24     3.910     2404       19       12        5    .143    2.7        2     .7     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------  1.2        3     .7
1 IDLE           28     .010    8.82      36     8.860     2177        7        5        3    .232    1.7        1     .7     0     17.6
2 16 HG          33     .020   10.56      48    10.616    11068       37       42       17    .077    2.9        3    1.3    26     16.0
3 10 HG          37     .070   12.05      85    12.160    17690       58      206       41    .147    8.5       30    6.0    63     10.0
4 16 HG          33     .030   10.68      48    10.746    11068       37       62       16    .077    2.8        5    1.3    26     16.0
5 19 HG          28     .020    9.12      36     9.170     7757       26       34       10    .057    1.5        2     .6     9     19.0
6 16 HG          33     .030   10.56      50    10.626    11068       37       63       17    .077    2.9        5    1.3    26     16.0
7  3 HG          42     .100   12.59     110    12.735    23497       84      373       67    .113    9.5       42    7.6   101      3.0
8 16 HG          33     .040   10.68      50    10.756    10168       34       76       16    .077    2.6        6    1.2    26     16.0
9 C.T.           29     .010    3.87      24     3.911     2404       19       12        5    .143    2.8        2     .7     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------  1.2        3     .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------  1.2        4    1.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------  1.2        3     .7
FOUR CYCLE COMPOSITE =                      HC= NDIR 0.35(     1.2) + 0.65(     1.2) =     1.201   GM/BHP HR
                                            CO= NDIR 0.35(     3.6) + 0.65(     3.2) =     3.337   GM/BHP HR
                                            NO2=NDIR 0.35(     1.1) + 0.65(      .7) =      .865   GM/BHP HR
                                                                 CORRECTED NO2 =      .781   GM/BHP HR
                                                                          BSFC =      .746   LB/BHP HR


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                 CONCENTRATION AS MEASURED      TOTAL     FUEL        CALCULATED GM/HR          WT.      WEIGHTED GM/HR             MAN.
MODE           HC-FID     CO     CO2   NO-CL    CARBON    CONS.       HC       CO      NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
----------------------------------------------------------------------------------------------------------------------------
1 IDLE          322     .020    8.02      25     8.072     2177        9       11        2    .232    2.0        3     .5     0     17.6
2 16 HG         260     .040   10.44      82    10.506    11068       27       85       29    .077    2.1        7    2.2    26     16.0
3 10 HG         323     .080   11.92     203    12.032    17690       48      238       99    .147    7.0       35   14.6    63     10.0
4 16 HG         206     .040   10.56      58    10.621    11068       22       84       20    .077    1.7        6    1.5    26     16.0
5 19 HG         101     .010    8.32      11     8.340     7757        9       19        3    .057     .5        1     .2     9     19.0
6 16 HG         234     .030   10.44      33    10.493    11068       25       64       12    .077    1.9        5     .9    26     16.0
7  3 HG         359     .110   12.45     116    12.596    23497       67      415       72    .113    7.6       47    8.1   101      3.0
8 16 HG         165     .040   10.68      38    10.736    10168       16       77       12    .077    1.2        6     .9    26     16.0
9 C.T.          195     .010    3.87       5     3.899     2404       12       12        1    .143    1.7        2     .1     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   .9        4    1.0
1 IDLE          322     .020    8.02      25     8.072     2177        9       11        2    .232    2.0        3     .5     0     17.5
2 16 HG         206     .020   10.44      23    10.481    11068       22       43        8    .077    1.7        3     .6    26     16.0
3 10 HG         222     .070   11.92      47    12.012    17690       33      208       23    .147    4.8       31    3.4    63     10.0
4 16 HG         158     .030   10.56      19    10.606    11068       16       63        7    .077    1.3        5     .5    26     16.0
5 19 HG         115     .010    8.92       4     8.941     7757       10       18        1    .057     .6        1     .1     9     19.0
6 16 HG         210     .040   10.56      24    10.621    11068       22       84        8    .077    1.7        6     .6    26     16.0
7  3 HG         339     .100   12.59      61    12.724    23497       63      373       37    .113    7.1       42    4.2   101      3.0
8 16 HG         152     .040   10.68      21    10.735    10168       15       77        7    .077    1.1        6     .5    26     16.0
9 C.T.          195     .010    3.99       3     4.019     2404       12       12        1    .143    1.7        2     .1     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   .7        3     .4
1 IDLE          169     .010    8.82       1     8.847     2177        4        5        0    .232    1.0        1     .0     0     17.6
2 16 HG         195     .020   10.56      22    10.600    11068       20       42        8    .077    1.6        3     .6    26     16.0
3 10 HG         209     .070   12.05      44    12.141    17690       30      206       21    .147    4.5       30    3.1    63     10.0
4 16 HG         152     .030   10.56      18    10.605    11068       16       63        6    .077    1.2        5     .5    26     16.0
5 19 HG         112     .010    9.02       4     9.041     7757       10       17        1    .057     .5        1     .1     9     19.0
6 16 HG         206     .030   10.56      23    10.611    11068       22       63        8    .077    1.7        5     .6    26     16.0
7  3 HG         328     .090   12.45      63    12.573    23497       61      340       39    .113    6.9       38    4.4   101      3.0
8 16 HG         144     .040   10.68      17    10.734    10168       14       77        5    .077    1.1        6     .4    26     16.0
9 C.T.          181     .010    3.87       3     3.898     2404       11       12        1    .143    1.6        2     .1     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   .7        3     .3
1 IDLE          169     .010    8.82       1     8.847     2177        4        5        0    .232    1.0        1     .0     0     17.6
2 16 HG         192     .020   10.56      18    10.599    11068       20       42        6    .077    1.5        3     .5    26     16.0
3 10 HG         219     .070   12.05      45    12.142    17690       32      206       22    .147    4.7       30    3.2    63     10.0
4 16 HG         152     .030   10.68      19    10.725    11068       16       63        7    .077    1.2        5     .5    26     16.0
5 19 HG         112     .020    9.12       4     9.151     7757        9       34        1    .057     .5        2     .1     9     19.0
6 16 HG         199     .030   10.56      21    10.610    11068       21       63        7    .077    1.6        5     .6    26     16.0
7  3 HG         332     .100   12.59      61    12.723    23497       61      373       37    .113    6.9       42    4.2   101      3.0
8 16 HG         162     .040   10.68      16    10.735    10168       14       77        5    .077    1.1        6     .4    26     16.0
9 C.T.          187     .010    3.87       3     3.899     2404       12       12        1    .143    1.7        2     .1     0     24.5
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   .7        3     .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------   .8        4     .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------   .7        3     .3
FOUR CYCLE COMPOSITE =                      HC= FID  0.35(      .8) + 0.65(      .7) =      .732   GM/BHP HR
                                            CO= NDIR 0.35(     3.6) + 0.65(     3.2) =     3.342   GM/BHP HR
                                            NO2-CL   0.35(      .7) + 0.65(      .3) =      .453   GM/BHP HR
                                                                 CORRECTED NO2 =      .409   GM/BHP HR
                                                                          BSFC =      .746   LB/BHP HR
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                  TABLE G-40. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-1P  TEST 120 [illegible] CAT-2AIR 701-[illegible]  10-18-73       K = .990      HUM = 58.4  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR                MAN.
MODE            HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.    HC      CO     NO2     HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          37    .010    8.86     46    8.910    2177      10       5       4    .232     2.3      1      .4      0    17.6
2 16 HG         35    .020   10.47    122   10.538   11068      40      42      43    .077     3.1      3     3.3     26    16.0
3 10 HG         38    .060   11.99    250   12.091   17690      60     177     121    .147     8.8     26    17.9     63    10.0
4 16 HG         32    .030   10.65     97   10.715   11068      36      63      33    .077     2.7      5     2.6     26    16.0
5 19 HG         24    .010    8.89     65    8.926    7757      23      18      19    .057     1.3      1     1.1      9    19.0
6 16 HG         33    .030   10.63     89   10.696   11068      37      63      31    .077     2.8      5     2.4     26    16.0
7  3 HG         38    .100   12.70    173   12.841   23497      75     370     105    .113     8.5     42    11.9    101     3.0
8 16 HG         32    .030   10.65     87   10.709   10168      28      58      27    .077     2.1      4     2.1     26    16.0
9 C.T.          26    .010    9.10     46    9.137    2409      16      12       9    .143     2.2      2     1.3      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     1.2      3     1.5
1 IDLE          37    .010    8.86     46    8.910    2177      10       5       4    .232     2.3      1      .4      0    17.6
2 16 HG         29    .030   10.66     67   10.710   11068      31      63      23    .077     2.4      5     1.8     26    16.0
3 10 HG         34    .080   12.23    110   12.347   17690      53     232      52    .147     7.7     34     7.7     63    10.0
4 16 HG         29    .050   10.73     74   10.806   11068      27     103      25    .077     2.0      8     1.9     26    16.0
5 19 HG         19    .030    8.91     45    8.961    7757      18      52      13    .057     1.0      3      .7      9    19.0
6 16 HG         27    .050   10.83     84   10.909   11068      30     102      28    .077     2.3      8     2.2     26    16.0
7  3 HG         35    .100   12.76    115   12.898   23497      69     368      71    .113     7.8     42     8.1    101     3.0
8 16 HG         21    .050   10.66     66   10.733   10168      21      96      21    .077     1.7      7     1.6     26    16.0
9 C.T.          22    .010    9.02     41    9.054    2409      19      12       8    .143     2.0      2     1.2      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     1.0      4      .9
1 IDLE          21    .020    9.48     51    9.523    2177       5       9       4    .232     1.2      2      .9      0    17.6
2 16 HG         24    .030   10.91     71   10.966   11068      26      61      24    .077     2.0      5     1.8     26    16.0
3 10 HG         28    .070   12.04     95   12.140   17690      44     206      46    .147     6.5     30     6.8     63    10.0
4 16 HG         20    .090   10.40     62   10.462   11068      23      85      22    .077     1.8      7     1.7     26    16.0
5 19 HG         21    .020    9.20     49    9.243    7757      19      34      19    .057     1.1      2      .8      9    19.0
6 16 HG         25    .090   11.27     72   11.337   11068      26      79      23    .077     2.0      6     1.8     26    16.0
7  3 HG         32    .110   13.02    110   13.165   23497      62     397      65    .113     7.0     45     7.4    101     3.0
8 16 HG         20    .050   10.67     63   10.742   10168      20      96      20    .077     1.6      7     1.5     26    16.0
9 C.T.          20    .020    9.05     38    9.092    2409      13      24       7    .143     1.8      3     1.1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .9      4      .8
1 IDLE          21    .020    9.49     51    9.623    2177       5       9       4    .232     1.2      2      .9      0    17.6
2 16 HG         25    .030   11.28     87   11.337   11068      26      59      28    .077     2.0      5     2.2     26    16.0
3 10 HG         26    .080   11.79     95   11.888   17690      42     240      47    .147     6.1     35     6.9     63    10.0
4 16 HG         23    .040    9.91     55    9.975   11068      28      90      20    .077     2.1      7     1.6     26    16.0
5 19 HG         18    .020    9.59     42    9.629    7757      16      33      11    .057      .9      2      .6      9    19.0
6 16 HG         26    .040   11.48     70   11.598   11068      27      77      22    .077     2.1      6     1.7     26    16.0
7  3 HG         31    .110   13.19    115   13.283   23497      59     393      68    .113     6.7     44     7.6    101     3.0
8 16 HG         20    .050   10.56     61   10.632   10168      21      97      19    .077     1.6      7     1.5     26    16.0
9 C.T.          18    .020    9.00     38    9.039    2409      12      24       8    .143     1.7      3     1.1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .8      4      .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     1.1      3     1.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      .8      4      .8
FOUR CYCLE COMPOSITE =                     HC= NDIR 0.35(    1.1) + 0.65(     .8) =    .926   GM/BHP HR
                                           CO= NDIR 0.35(    3.4) + 0.65(    3.8) =   3.628   GM/BHP HR
                                           NO2=NDIR 0.35(    1.2) + 0.65(     .8) =    .946   GM/BHP HR
                                                              CORRECTED NO2 =    .889   GM/BHP HR
                                                                       BSFC =    .746   LB/BHP HR


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                CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR                MAN.
MODE           HC-FID   CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID     CO   NO2-CL    HP     VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         298    .010    8.86      7    8.900    2177       7       5       1    .232     1.7      1      .1      0    17.6
2 16 HG        223    .020   10.44     52   10.522   11068      23      42      18    .077     1.8      3     1.4     26    16.0
3 10 HG        275    .060   11.99    220   12.077   17690      40     174     107    .147     5.9     26    15.7     63    10.0
4 16 HG        189    .030   10.65     74   10.699   11068      20      63      25    .077     1.5      5     2.1     26    16.0
5 19 HG        122    .010    8.89     25    8.912    7757      11      18       7    .057      .6      1      .4      9    19.0
6 16 HG        216    .030   10.63     41   10.682   11068      22      63      14    .077     1.7      5      .1     26    16.0
7  3 HG        332    .100   12.70    117   12.833   23497      61     370      71    .113     6.9     42     8.0    101     3.0
8 16 HG        155    .030   10.65     50   10.695   10168      15      58      16    .077     1.1      4     1.2     26    16.0
9 C.T.         142    .010    9.10      5    9.128    2409      11      12       1    .143     1.5      2      .1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .8      3
1 IDLE         298    .010    8.86      7    8.900    2177       7       5       1    .232     1.7      1      .1      0    17.6
2 16 HG        196    .030   10.65     18   10.700   11068      20      63       6    .077     1.6      5      .5     26    16.0
3 10 HG        254    .080   12.23     52   12.335   17690      36     232      25    .147     5.4     34     3.6     63    10.0
4 16 HG        172    .050   10.73     20   10.797   11068      18     104       7    .077     1.4      8      .5     26    16.0
5 19 HG        115    .030    8.91      5    8.951    7757      10      53       1    .057      .6      3      .1      9    19.0
6 16 HG        214    .050   10.84     29   10.901   11068      22     103      10    .077     1.7      8      .8     26    16.0
7  3 HG        318    .100   12.76     56   12.892   23497      58     368      34    .113     6.5     42     3.8    101     3.0
8 16 HG        144    .050   10.66     19   10.724   10168      14      96       6    .077     1.1      7      .5     26    16.0
9 C.T.         162    .010    9.02      3    9.046    2409      10      12       1    .143     1.4      2      .1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .7      4      .4
1 IDLE         129    .020    9.48      1    9.513    2177       3       9       0    .232      .7      2      .0      0    17.6
2 16 HG        186    .030   10.91     18   10.959   11068      19      61       6    .077     1.4      5      .5     26    16.0
3 10 HG        205    .070   12.04     42   12.130   17690      30     206      20    .147     4.4     30     3.0     63    10.0
4 16 HG        197    .040   10.40     18   10.455   11068      16      86       6    .077     1.2      7      .5     26    16.0
5 19 HG        109    .020    9.20      4    9.231    7757       9      34       1    .057      .5      2      .1      9    19.0
6 16 HG        197    .040   11.27     25   11.330   11068      19      79       8    .077     1.5      6      .6     26    16.0
7  3 HG        305    .110   13.02     56   13.161   23497      54     397      33    .113     6.2     45     3.8    101     3.0
8 16 HG        134    .050   10.67     16   10.733   10168      13      96       5    .077     1.0      7      .4     26    16.0
9 C.T.         149    .020    9.05      3    9.085    2409       9      24       1    .143     1.3      3      .1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .6      4      .4
1 IDLE         129    .020    9.48      1    9.513    2177       3       9       0    .232      .7      2      .0      0    17.6
2 16 HG        183    .030   11.28     18   11.328   11068      18      59       6    .077     1.4      5      .4     26    16.0
3 10 HG        209    .080   11.78     45   11.881   17690      31     241      22    .147     4.6     35     3.3     63    10.0
4 16 HG        137    .040    9.91     18    9.964   11068      15      90       7    .077     1.2      7      .5     26    16.0
5 19 HG        102    .020    9.59      4    9.620    7757       8      33       1    .057      .5      2      .1      9    19.0
6 16 HG        187    .040   11.48     25   11.539   11068      18      78       8    .077     1.4      6      .6     26    16.0
7  3 HG        299    .110   13.14     51   13.280   23497      54     393      30    .113     6.0     44     3.4    101     3.0
8 16 HG        120    .050   10.56     18   10.622   10168      11      97       6    .077      .9      7      .4     26    16.0
9 C.T.         143    .020    9.00      3    9.034    2409       9      24       1    .143     1.2      3      .1      0    24.5
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .6      4      .3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      .8      3      .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      .6      4      .3
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(     .8) + 0.65(     .6) =    .662   GM/BHP HR
                                           CO- NDIR 0.35(    3.4) + 0.65(    3.8) =   3.631   GM/BHP HR
                                           NO2-CL   0.35(     .7) + 0.65(     .3) =    .437   GM/BHP HR
                                                              CORRECTED NO2 =    .411   GM/BHP HR
                                                                       BSFC =    .746   LB/BHP HR
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                      TABLE G-41. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-1P  TEST 121  RUN 1  [illegible] CAT=AIR 201-SHPV 10-19-73     K = .900     HUM = 48.7  GM/LB
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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR     WT.      WEIGHTED GM/HR          MAN.
MODE         HC     CO     CO2     NO     CARBON   CONS.      HC     CO    NO2   FACT.    HC      CO    NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE       31    .020    9.88    48     9.936    2359        8     10     4    .232    2.0      2     .9     0   17.6
2 16 HG      27    .020   11.09    73    11.089   11658       31     42    25    .077    2.4      3    2.0    28   16.0
3 10 HG      31    .050   12.45   160    12.544   17600       50    120    75    .147    7.4     25   11.0    64   10.0
4 16 HG      23    .050   11.09    61    11.115   11658       26    106    21    .077    2.0      8    1.6    28   16.0
5 19 HG      19    .010    9.33    24     9.361    7348       16     16     6    .052     .9      1     .4     7   19.0
6 16 HG      37    .030   11.09    61    11.110   11658       42     64    21    .077    3.2      5    1.6    28   16.0
7  3 HG      37    .280   13.58   124    13.900   24948       72   1015    73    .113    8.1    115    8.3   102    3.0
8 16 HG      19    .040   11.09    48    11.101   11658       22     85    17    .077    1.7      7    1.3    28   16.0
9 C.T.       42    .010    5.00    24     5.055    2268       20      9     4    .143    2.9      1     .5     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    1.0      6     .4
1 IDLE       33    .020    9.88    24     9.936    2359        8     10     2    .232    2.0      2     .4     0   17.6
2 16 HG      28    .030   11.09    74    11.100   11658       32     64    25    .077    2.4      5    2.0    28   16.0
3 10 HG      33    .050   12.59   110    12.676   17600       44    140    51    .147    7.3     21    7.5    64   10.0
4 16 HG      36    .040   11.09    36    11.119   11658       41     85    13    .077    3.1      7    1.0    28   16.0
5 19 HG      23    .020    9.44    36     9.485    7348       19     31     9    .052    1.1      2     .5     7   19.0
6 16 HG      37    .040   11.09    74    11.120   11658       42     85    25    .077    3.2      7    2.0    28   16.0
7  3 HG      37    .310   13.58   135    13.930   24948       72   1121    80    .113    8.1    127    9.1   102    3.0
8 16 HG      19    .040   11.09    48    11.101   11658       22     85    17    .077    1.7      7    1.3    28   16.0
9 C.T.       42    .010    4.93    24     4.985    2268       21      9     4    .143    3.0      1     .5     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    1.1      6     .8
1 IDLE       28    .040   10.33    48    10.400    2359        7     18     4    .232    1.6      4     .8     0   17.6
2 16 HG      37    .040   11.09    73    11.120   11658       42     85    25    .077    3.2      7    2.0    28   16.0
3 10 HG      42    .050   12.45   122    12.540   17600       56    142    57    .147    8.2     21    8.4    64   10.0
4 16 HG      28    .040   11.09    48    11.110   11658       32     85    17    .077    2.4      7    1.3    28   16.0
5 19 HG      23    .010    9.44    16     9.475    7348       19     16     4    .052    1.1      1     .5     7   19.0
6 16 HG      26    .040   11.09    44    11.108   11658       29     85    34    .077    2.3      7    2.6    28   16.0
7  3 HG      37    .320   13.58   135    13.940   24948       72   1157    80    .113    8.1    131    9.1   102    3.0
8 16 HG      23    .040   11.09    48    11.105   11658       26     85    17    .077    2.0      7    1.3    28   16.0
9 C.T.       42    .010    5.00    36     5.055    2268       20      4     5    .143    2.9      1     .8     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    1.1      6     .4
1 IDLE       29    .040   10.33    48    10.400    2359        7     18     4    .232    1.6      4     .8     0   17.6
2 16 HG      37    .040   11.09    85    11.120   11658       42     85    40    .077    3.2      7    2.3    28   16.0
3 10 HG      33    .050   12.45   122    12.536   17600       50    142    57    .147    7.4     21    8.4    64   10.0
4 16 HG      28    .020   11.09    73    11.090   11658       32     42    25    .077    2.4      3    2.0    28   16.0
5 19 HG      23    .010    9.44    48     9.475    7348       19     16    12    .052    1.1      1     .7     7   19.0
6 16 HG      28    .040   11.34    85    11.110   11658       32     85    30    .077    2.4      7    2.3    28   16.0
7  3 HG      41    .330   13.58   140    13.954   24948       74   1192    88    .113    8.4    135    9.9   102    3.0
8 16 HG      23    .040   11.29    73    11.345   11658       26     83    25    .077    2.0      6    1.9    28   16.0
9 C.T.       42    .010    5.00    28     5.055    2268       20      9     4    .143    2.9      1     .6     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    1.1      6    1.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------    1.0      6     .9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------    1.1      6     .9
FOUR CYCLE COMPOSITE =              HC= NDIR 0.35(     1.0) + 0.65(     1.1) =    1.052   GM/BHP HR
                                    CO= NDIR 0.35(     5.7) + 0.65(     6.1) =    5.981   GM/BHP HR
                                    NO2=NDIR 0.35(      .9) + 0.65(      .9) =     .900   GM/BHP HR
                                                            CORRECTED NO2 =     .810   GM/BHP HR
                                                                     BSFC =     .753   LB/BHP HR


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            CONCENTRATION AS MEASURED     TOTAL    FUEL      CALCULATED GM/HR     WT.      WEIGHTED GM/HR          MAN.
MODE       HC-FID   CO     CO2   NO-CL    CARBON   CONS.      HC     CO    NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE      382    .020    9.88    25     9.938    2359        9     10     2    .232    2.1      2     .5     0   17.6
2 16 HG     220    .020   11.09    56    11.082   11658       23     42    20    .077    1.8      3    1.5    28   16.0
3 10 HG     335    .060   12.45    73    12.543   17600       47    170    34    .147    6.9     25    5.0    64   10.0
4 16 HG     235    .050   11.09    46    11.114   11658       25    105    16    .077    1.9      8    1.2    28   16.0
5 19 HG     123    .010    9.33    10     9.352    7348       10     16     3    .052     .5      1     .1     7   19.0
6 16 HG     241    .030   11.09    38    11.094   11658       25     64    13    .077    2.0      5    1.0    28   16.0
7  3 HG     451    .280   13.58    93    13.905   24948       81   1015    55    .113    9.1    115    6.4   102    3.0
8 16 HG     138    .040   11.09    31    11.094   11658       14     85    11    .077    1.1      7     .8    28   16.0
9 C.T.      484    .010    5.00    13     5.058    2268       22      9     2    .143    3.1      1     .3     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     .9      6     .6
1 IDLE      382    .020    9.88    25     9.938    2359        9     10     2    .232    2.1      2     .5     0   17.6
2 16 HG     207    .030   11.09    38    11.091   11658       22     64    13    .077    1.7      5    1.0    28   16.0
3 10 HG     322    .050   12.59    75    12.672   17600       45    140    35    .147    6.6     21    5.1    64   10.0
4 16 HG     200    .040   11.09    23    11.100   11658       21     85     8    .077    1.6      7     .6    28   16.0
5 19 HG     123    .020    9.44     9     9.472    7348       10     31     2    .052     .5      2     .1     7   19.0
6 16 HG     235    .040   11.09    45    11.103   11658       25     85    16    .077    1.9      7    1.2    28   16.0
7  3 HG     423    .310   13.58    85    13.932   24948       76   1121    51    .113    8.6    127    5.7   102    3.0
8 16 HG     125    .040   11.09    30    11.092   11658       13     85    10    .077    1.0      7     .8    28   16.0
9 C.T.      342    .010    4.93    13     4.974    2268       18      9     2    .143    2.6      1     .3     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     .9      6     .5
1 IDLE      301    .040   10.33     8    10.400    2359        7     18     1    .232    1.6      4     .1     0   17.6
2 16 HG     214    .040   11.09    40    11.101   11658       22     85    14    .077    1.7      7    1.1    28   16.0
3 10 HG     321    .050   12.45    70    12.532   17600       45    142    33    .147    6.6     21    4.8    64   10.0
4 16 HG     193    .040   11.09    33    11.099   11658       20     85    12    .077    1.5      7     .9    28   16.0
5 19 HG     104    .010    9.44     8     9.461    7348        8     16     2    .052     .5      1     .1     7   19.0
6 16 HG     227    .040   11.09    45    11.103   11658       24     85    16    .077    1.8      7    1.2    28   16.0
7  3 HG     423    .320   13.58    86    13.942   24948       76   1157    51    .113    8.6    131    5.8   102    3.0
8 16 HG     118    .040   11.09    30    11.092   11658       12     85    10    .077    1.0      7     .8    28   16.0
9 C.T.      342    .010    5.00    10     5.049    2268       18      9     1    .143    2.5      1     .2     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     .9      6     .5
1 IDLE      301    .040   10.33     8    10.400    2359        7     18     1    .232    1.6      4     .1     0   17.6
2 16 HG     207    .040   11.09    43    11.101   11658       22     85    15    .077    1.7      7    1.2    28   16.0
3 10 HG     321    .050   12.45    73    12.532   17600       45    142    34    .147    6.6     21    5.0    64   10.0
4 16 HG     143    .020   11.09    40    11.079   11658       20     43    14    .077    1.5      3    1.1    28   16.0
5 19 HG     123    .010    9.44     4     9.462    7348       10     16     1    .052     .5      1     .1     7   19.0
6 16 HG     227    .040   11.09    46    11.103   11658       24     85    16    .077    1.8      7    1.2    28   16.0
7  3 HG     438    .330   13.58    85    13.954   24948       78   1192    50    .113    8.8    135    5.7   102    3.0
8 16 HG     125    .040   11.28    40    11.332   11658       13     83    14    .077    1.0      6    1.1    28   16.0
9 C.T.      419    .010    5.00    12     5.052    2268       19      9     2    .143    2.7      1     .3     0   24.6
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------     .9      6     .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------     .9      6     .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------     .9      6     .5
FOUR CYCLE COMPOSITE =              HC= FID  0.35(      .9) + 0.65(      .9) =     .884   GM/BHP HR
                                    CO= NDIR 0.35(     5.7) + 0.65(     6.1) =    5.981   GM/BHP HR
                                    NO2=CL   0.35(      .5) + 0.65(      .5) =     .518   GM/BHP HR
                                                            CORRECTED NO2 =     .466   GM/BHP HR
                                                                     BSFC =     .753   LB/BHP HR
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                    TABLE G-12. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-1P  TEST 121 RUN 2  [illegible] REPAIR KAJ-RRPV  10-19-79      H = .920     HUM = 53.3  GR/LB
------------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR            MAN.
MODE          HC     CO     CO2     NO     CARBON    CONS.     HC     CO     NO2    FACT.   HC       CO    NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE        24    .020  10.66     60    10.605     2223       5      8      3    .232    1.2      2      .6     0    17.6
2 16 HG       19    .010  10.21     78    10.241    10750      22     21     27    .077    1.7      2     2.1    26    16.0
3 10 HG       29    .010  11.79    499    11.830    16057      41     27    180    .147    6.0      4    26.4    63    10.0
4 16 HG       19    .010  10.10    173    10.131    10750      22     21     61    .077    1.7      2     4.7    26    16.0
5 19 HG       17    .010   8.82     75     8.848     7620      16     17     21    .057     .9      1     1.2     8    19.0
6 16 HG       19    .010  10.21    186    10.241    10750      22     21     65    .077    1.7      2     5.0    26    16.0
7  3 HG       28    .010  12.26   1666    12.290    22090      54     36    499    .113    6.1      4   112.3   100     3.0
8 16 HG       19    .010  10.21    261    10.241    10750      22     21     87    .077    1.7      2     6.7    26    16.0
9 C.T.        42    .010   9.93     73     9.985     2354      21     10     11    .143    3.1      1     1.6     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .8      1     5.5
1 IDLE        23    .020  10.66     60    10.605     2223       5      8      3    .232    1.2      2      .8     0    17.6
2 16 HG       20    .010  10.33     73    10.362    10750      22     21     25    .077    1.7      2     1.9    26    16.0
3 10 HG       29    .010  11.79    447    11.831    16057      43     27    201    .147    6.2      4    24.6    63    10.0
4 16 HG       23    .010  10.34    194    10.365    10750      26     21     69    .077    2.0      2     5.3    26    16.0
5 19 HG       19    .010   8.82     85     8.851     7620      18     17     24    .057    1.0      1     1.4     8    19.0
6 16 HG       23    .010  10.15    188    10.185    10750      26     21     66    .077    2.0      2     5.1    26    16.0
7  3 HG       28    .013  12.31   2080    12.350    22090      54     36   1235    .113    6.1      4   139.6   100     3.0
8 16 HG       19    .010  10.33    261    10.361    10750      21     21     86    .077    1.6      2     6.7    26    16.0
9 C.T.        45    .010   9.88     73     9.908     2354      18     10     12    .143    2.6      1     1.7     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .8      1     6.6
1 IDLE        24    .030  10.38     60    10.440     2223       6     13      4    .232    1.5      3      .8     0    17.6
2 16 HG       21    .010  10.33     88    10.363    10750      24     21     30    .077    1.8      2     2.3    26    16.0
3 10 HG       43    .020  11.79    371    11.846    16057      48     55    167    .147    7.1      8    24.5    63    10.0
4 16 HG       23    .010  10.21    206    10.245    10750      26     21     71    .077    2.0      2     5.5    26    16.0
5 19 HG       16    .010   8.82     90     8.847     7620      15     17     28    .057     .8      1     1.6     8    19.0
6 16 HG       23    .010  10.33    225    10.365    10750      26     21     77    .077    2.0      2     6.0    26    16.0
7  3 HG       24    .010  12.31   1964    12.350    22090      54     36   1166    .113    6.1      4   131.8   100     3.0
8 16 HG       19    .010  10.21    255    10.241    10750      22     21     89    .077    1.7      2     6.8    26    16.0
9 C.T.        45    .010   9.93     87     9.978     2359      18     10     15    .143    2.6      1     2.2     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .9      1     6.2
1 IDLE        28    .030  10.38     60    10.440     2223       6     13      4    .232    1.5      3      .8     0    17.6
2 16 HG       21    .010  10.26     84    10.293    10750      24     21     29    .077    1.8      2     2.3    26    16.0
3 10 HG       33    .020  11.75    469    11.806    16057      48     55    207    .147    7.1      8    30.6    63    10.0
4 16 HG       23    .010  10.21    195    10.245    10750      26     21     68    .077    2.0      2     5.2    26    16.0
5 19 HG       15    .010   8.82     88     8.846     7620      14     17     25    .057     .8      1     1.4     8    19.0
6 16 HG       23    .010  10.33    225    10.365    10750      26     21     77    .077    2.0      2     6.0    26    16.0
7  3 HG       28    .010  12.24   1968    12.280    22090      54     36   1175    .113    6.1      4   132.8   100     3.0
8 16 HG       14    .010  10.21    260    10.241    10750      22     21     87    .077    1.7      2     6.7    26    16.0
9 C.T.        41    .010   9.93     80     9.973     2359      16     10     13    .143    2.3      1     1.8     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .9      1     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       .8      1     6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       .9      1     6.3
FOUR CYCLE COMPOSITE =
                                    HC= NDIR 0.35(      .8) + 0.65(      .9) =     .857   GM/BHP HR
                                    CO= NDIR 0.35(      .6) + 0.65(      .8) =     .761   GM/BHP HR
                                    NO2=NDIR 0.35(     6.0) + 0.65(     6.3) =    6.218   GM/BHP HR
                                                        CORRECTED NO2 =    5.718   GM/BHP HR
                                                                 BSFC =     .713   LB/BHP HR


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              CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR      WT.      WEIGHTED GM/HR            MAN.
MODE          HC-FID   CO     CO2   NO-CL  CARBON    CONS.     HC     CO     NO2    FACT.  HC-FID     CO   NO2-CL  HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       192    .020  10.66     26    10.599     2223       4      8      2    .232     .9      2      .4     0    17.6
2 16 HG       86    .010  10.21     37    10.228    10750       9     21     13    .077     .7      2     1.0    26    16.0
3 10 HG      181    .010  11.79    320    11.818    16057      25     27    162    .147    3.6      4    23.8    63    10.0
4 16 HG       82    .010  10.10    150    10.118    10750       9     21     53    .077     .7      2     4.1    26    16.0
5 19 HG       27    .010   8.82     55     8.833     7620       2     17     16    .057     .1      1      .9     8    19.0
6 16 HG      109    .010  10.21    180    10.231    10750      12     21     63    .077     .9      2     4.8    26    16.0
7  3 HG      181    .010  12.25   1588    12.278    22090      33     36    949    .113    3.7      4   107.2   100     3.0
8 16 HG       82    .010  10.21    235    10.228    10750       9     21     82    .077     .7      2     6.3    26    16.0
9 C.T.       426    .019   9.93     90     9.982     2354      20     10      6    .143    2.9      1      .9     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .5      1     5.1
1 IDLE       192    .020  10.66     26    10.599     2223       4      8      2    .232     .9      2      .4     0    17.6
2 16 HG      129    .010  10.33     48    10.352    10750      13     21     17    .077    1.0      2     1.3    26    16.0
3 10 HG      226    .010  11.79    465    11.823    16057      31     27    183    .147    4.5      4    26.9    63    10.0
4 16 HG      110    .010  10.33    180    10.351    10750      11     21     62    .077     .9      2     4.8    26    16.0
5 19 HG       30    .010   8.82     58     8.834     7620       3     17     17    .057     .2      1      .9     8    19.0
6 16 HG      116    .010  10.15    170    10.172    10750      12     21     60    .077     .9      2     4.6    26    16.0
7  3 HG      188    .010  12.31   1975    12.339    22090      34     36   1174    .113    3.8      4   132.6   100     3.0
8 16 HG       92    .010  10.33    243    10.348    10750       9     21     84    .077     .7      2     6.5    26    16.0
9 C.T.       359    .010   9.86     45     9.906     2354      17     10      7    .143    2.5      1     1.0     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .5      1     6.1
1 IDLE       301    .030  10.38     20    10.440     2223       6     13      1    .232    1.5      3      .3     0    17.6
2 16 HG      129    .010  10.33     40    10.352    10750      13     21     14    .077    1.0      2     1.1    26    16.0
3 10 HG      243    .023  11.79    310    11.834    16057      33     55    140    .147    4.8      8    20.5    63    10.0
4 16 HG      119    .010  10.21    173    10.231    10750      12     21     60    .077     .9      2     4.6    26    16.0
5 19 HG       39    .010   8.82     53     8.833     7620       3     17     15    .057     .2      1      .9     8    19.0
6 16 HG      124    .010  10.33    186    10.352    10750      13     21     64    .077    1.0      2     4.9    26    16.0
7  3 HG      195    .010  12.31   1838    12.339    22090      35     36   1092    .113    3.9      4   123.4   100     3.0
8 16 HG       69    .010  10.21    220    10.227    10750       7     21     77    .077     .6      2     5.9    26    16.0
9 C.T.       466    .010   9.94     45     9.977     2359      17     10      7    .143    2.5      1     1.0     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .6      1     5.6
1 IDLE       301    .030  10.38     20    10.440     2223       6     13      1    .232    1.5      3      .3     0    17.6
2 16 HG      119    .010  10.26     70    10.282    10750      12     21     24    .077    1.0      2     1.9    26    16.0
3 10 HG      222    .020  11.75    400    11.792    16057      30     55    181    .147    4.4      8    26.6    63    10.0
4 16 HG       99    .010  10.21    184    10.230    10750      10     21     66    .077     .8      2     5.1    26    16.0
5 19 HG       27    .010   8.82     60     8.833     7620       2     17     17    .057     .1      1     1.0     8    19.0
6 16 HG      117    .010  10.33    215    10.351    10750      12     21     74    .077     .9      2     5.7    26    16.0
7  3 HG      177    .010  12.24   1963    12.268    22090      32     36   1114    .113    3.6      4   125.9   100     3.0
8 16 HG       69    .010  10.21    240    10.227    10750       7     21     84    .077     .6      2     6.4    26    16.0
9 C.T.       395    .010   9.93     45     9.980     2359      19     10      7    .143    2.7      1     1.0     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------       .5      1     5.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------       .5      1     5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------       .5      1     5.8
FOUR CYCLE COMPOSITE =
                                    HC= FID  0.35(      .5) + 0.65(      .5) =     .532   GM/BHP HR
                                    CO= NDIR 0.35(      .6) + 0.65(      .8) =     .762   GM/BHP HR
                                    NO2=CL   0.35(     5.6) + 0.65(     5.8) =    5.714   GM/BHP HR
                                                        CORRECTED NO2 =    5.255   GM/BHP HR
                                                                 BSFC =     .713   LB/BHP HR
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                TABLE G-43, MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-1   TEST 124  RUN 1  W/O CAT, 20JETS-COPY  10-14-73      K = .953     HUM = 61.7  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE            HC     CO     CO2     NO     CARBON   CONS.       HC      CO     NO2    FACT.   HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          28    .010   10.80    61    10.840    2132        6       9       4    .232    1.4        1      .9     0    17.2
2 16 HG         28    .030   12.72   147    12.780   11794       28      56      45    .077    2.1        4     3.5    28    16.0
3 10 HG         33    .090   13.73   173    13.856   17237       44     226      71    .147    6.5       33    10.5    63    10.0
4 16 HG         33    .030   12.72    98    12.766   11794       33      56      30    .077    2.5        4     2.3    28    16.0
5 19 HG         19    .010   11.16    98    11.191    7484       19      19      11    .057     .9        1      .6     7    19.0
6 16 HG         24    .090   12.72    98    12.790   11794       28      75      15    .077    2.1        6     1.1    28    16.0
7  3 HG         37    .130   13.73   123    13.900   24222       70     458      71    .113    7.9       52     8.0   101     3.0
8 16 HG         23    .040   12.86    61    12.926   11794       23      74      18    .077    1.7        6     1.4    28    16.0
9 C.T.          33    .050    6.21    98     6.296    2177       12      35       6    .143    1.8        5      .8     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .9        4     1.0
1 IDLE          28    .010   10.80    61    10.840    2132        6       9       4    .232    1.4        1      .9     0    17.2
2 16 HG         28    .030   12.72    98    12.780   11794       28      56      30    .077    2.1        4     2.3    28    16.0
3 10 HG         33    .090   13.73   135    13.856   17237       44     226      56    .147    6.5       33     8.2    63    10.0
4 16 HG         23    .040   12.86    85    12.925   11794       23      74      26    .077    1.7        6     2.0    28    16.0
5 19 HG         23    .010   11.28    98    11.315    7484       16      13      11    .057     .9        1      .6     7    19.0
6 16 HG         28    .050   12.72    98    12.800   11794       28      93      30    .077    2.1        7     2.3    28    16.0
7  3 HG         37    .120   13.73   123    13.890   24222       70     423      71    .113    7.9       48     8.0   101     3.0
8 16 HG         23    .050   12.86    61    12.935   11794       23      92      18    .077    1.7        7     1.4    28    16.0
9 C.T.          33    .030    6.29    36     6.356    2177       12      21       4    .143    1.7        3      .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .9        4      .9
1 IDLE          24    .030   10.92    98    10.976    2132        5      12       3    .232    1.2        3      .7     0    17.2
2 16 HG         33    .030   12.72    98    12.786   11794       33      56      30    .077    2.5        4     2.4    28    16.0
3 10 HG         33    .100   13.58   144    13.716   17237       45     254      62    .147    6.6       37     9.1    63    10.0
4 16 HG         23    .040   12.86    85    12.925   11794       23      76      26    .077    1.7        6     2.0    26    16.0
5 19 HG         24    .010   11.16    98    11.195    7484       17      14      11    .057     .9        1      .6     7    19.0
6 16 HG         27    .040   12.72    98    12.789   11794       27      75      30    .077    2.1        6     2.3    28    16.0
7  3 HG         37    .140   13.73   110    13.910   24222       70     492      64    .113    7.9       56     7.2   101     3.0
8 16 HG         23    .050   12.86    61    12.935   11794       23      92      19    .077    1.7        7     1.4    28    16.0
9 C.T.          33    .060    6.29    35     6.386    2177       12      41       4    .143    1.7        6      .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .8        4      .9
1 IDLE          23    .030   10.92    48    10.974    2132        5      12       3    .232    1.1        3      .7     0    17.2
2 16 HG         28    .030   12.72   110    12.780   11794       28      56      34    .077    2.1        4     2.6    28    16.0
3 10 HG         28    .100   13.54   149    13.710   17237       38     254      62    .147    5.6       37     9.1    63    10.0
4 16 HG         23    .040   12.86    98    12.925   11794       23      74      30    .077    1.7        6     2.3    28    16.0
5 19 HG         18    .010   11.16    98    11.189    7484       13      14      11    .057     .7        1      .6     7    19.0
6 16 HG         28    .040   12.72    98    12.790   11794       28      75      30    .077    2.1        6     2.3    28    16.0
7  3 HG         33    .130   13.74   173    13.896   24222       62     458     100    .113    7.0       52    11.3   101     3.0
8 16 HG         28    .050   12.86    60    12.940   11794       28      92      18    .077    2.1        7     1.4    28    16.0
9 C.T.          28    .040    6.29    36     6.360    2177       10      28       4    .143    1.5        4      .6     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .8        4     1.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------      .9        4      .9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------      .8        4     1.0
FOUR CYCLE COMPOSITE =             HC= NDIR 0.35(      .9) + 0.65(      .8) =      .864    GM/BHP HR
                                   CO= NDIR 0.35(     3.7) + 0.65(     4.1) =     3.976    GM/BHP HR
                                   NO2=NDIR 0.35(      .9) + 0.65(     1.0) =      .951    GM/BHP HR
                                                          CORRECTED NO2 =      .906    GM/BHP HR
                                                                   BSFC =      .751    LB/BHP HR


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                CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE            HC-FID  CO     CO2    NO-CL  CARBON   CONS.       HC      CO     NO2    FACT.   HC-FID    CO   NO2-CL   HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         152    .010   10.80    10    10.825    2132        3       9       1    .232     .7        1      .2     0    17.2
2 16 HG        242    .030   12.72   100    12.773   11794       21      56      31    .077    1.6        4     2.4    28    16.0
3 10 HG        254    .090   13.74   110    13.895   17237       32     226      45    .147    4.6       33     6.7    63    10.0
4 16 HG        158    .030   12.72    46    12.766   11794       15      56      14    .077    1.1        4     1.1    28    16.0
5 19 HG        137    .010   11.16     3    11.181    7484        7      19       1    .057     .4        1      .0     7    19.0
6 16 HG        194    .040   12.72    43    12.780   11794       18      75      13    .077    1.4        6     1.0    28    16.0
7  3 HG        310    .130   13.73    66    13.891   24222       54     458      32    .113    6.1       52     3.7   101     3.0
8 16 HG        143    .040   12.86    26    12.911   11794       10      75       8    .077     .8        6      .6    28    16.0
9 C.T.         310    .050    6.21     6     6.291    2177       11      35       1    .143    1.5        5      .1     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .6        4      .5
1 IDLE         152    .010   10.80    10    10.825    2132        3       9       1    .232     .7        1      .2     0    17.2
2 16 HG        189    .030   12.72    63    12.769   11794       17      56      16    .077    1.3        4     1.3    28    16.0
3 10 HG        178    .040   13.74    75    13.838   17237       22     226      41    .147    3.3       33     4.6    63    10.0
4 16 HG        212    .040   12.86    45    12.911   11794       10      74      11    .077     .8        6      .8    28    16.0
5 19 HG         83    .010   11.24     8    11.299    7484        6      13       2    .057     .3        1      .1     7    19.0
6 16 HG        178    .050   12.72    39    12.788   11794       16      93      12    .077    1.3        7      .9    28    16.0
7  3 HG        325    .120   13.74    64    13.883   24222       57     421      42    .113    6.4       48     4.2   101     3.0
8 16 HG        119    .050   12.81    25    12.922   11794       11      92       8    .077     .8        7      .6    28    16.0
9 C.T.         418    .030    6.29     6     6.352    2177       11      21       1    .143    1.6        3      .1     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .6        4      .5
1 IDLE         172    .030   10.92     8    10.967    2132        3      12       1    .232     .8        3      .1     0    17.2
2 16 HG        202    .030   12.72    63    12.770   11794       19      56      16    .077    1.4        4     1.3    28    16.0
3 10 HG        212    .100   13.58    88    13.701   17237       27     254      37    .147    3.9       37     5.4    63    10.0
4 16 HG        140    .040   12.86    36    12.913   11794       12      74      11    .077     .9        6      .8    28    16.0
5 19 HG         89    .010   11.16     8    11.179    7484        6      14       2    .057     .3        1      .1     7    19.0
6 16 HG        186    .040   12.72    40    12.779   11794       17      75      12    .077    1.3        6      .9    28    16.0
7  3 HG        332    .140   13.74    63    13.903   24222       58     493      36    .113    6.5       56     4.1   101     3.0
8 16 HG        119    .050   12.86    25    12.922   11794       11      92       8    .077     .9        7      .6    28    16.0
9 C.T.         291    .060    6.29     6     6.374    2177       10      41       1    .143    1.4        6      .1     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .6        4      .5
1 IDLE         172    .030   10.92     8    10.967    2132        3      12       1    .232     .8        3      .1     0    17.2
2 16 HG        210    .030   12.72    56    12.771   11794       19      56      17    .077    1.5        4     1.3    28    16.0
3 10 HG        184    .100   13.58    76    13.698   17237       23     254      32    .147    3.4       37     4.7    63    10.0
4 16 HG        115    .040   12.86    40    12.912   11794       11      74      12    .077     .8        6      .9    28    16.0
5 19 HG         79    .010   11.16     8    11.178    7484        5      14       2    .057     .3        1      .1     7    19.0
6 16 HG        174    .040   12.72    43    12.777   11794       16      75      13    .077    1.2        6     1.0    28    16.0
7  3 HG        317    .140   13.74    63    13.892   24222       55     458      36    .113    6.2       52     4.1   101     3.0
8 16 HG        115    .050   12.81    30    12.922   11794       11      92       9    .077     .8        7      .7    28    16.0
9 C.T.         288    .040    6.29     8     6.358    2177       10      28       1    .143    1.4        4      .1     0    24.2
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------      .6        4      .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------------      .6        4      .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------------      .6        4      .4
FOUR CYCLE COMPOSITE =             HC= FID  0.35(      .6) + 0.65(      .6) =      .576    GM/BHP HR
                                   CO= NDIR 0.35(     3.7) + 0.65(     4.1) =     3.928    GM/BHP HR
                                   NO2=CL   0.35(      .5) + 0.65(      .4) =      .457    GM/BHP HR
                                                          CORRECTED NO2 =      .436    GM/BHP HR
                                                                   BSFC =      .751    LB/BHP HR
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                 TABLE G-44. 435 EMISSIONS BY NINE-MODE FTP
ENGINE 2-1    TEST 124  WITH 2  CAT. 20JETS-60PV  10-14-73       K = .930     HUM = 55.9  GR/LB
----------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE          HC      CO     CO2      NO   CARBON   CONS.     HC      CO      NO2    FACT.   HC        CO     NO2     HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        30    .090   10.92      23   10.992    2132      6      16        5    .232    1.5        4     1.1            17.2
2 16 HG       33    .050   12.86     148   12.996   11794     32      92       45    .077    2.5        7     3.4     28     16.0
3 10 HG       37    .130   13.58     196   13.750   17237     50     329       77    .147    7.4       48    11.4     63     10.0
4 16 HG       28    .050   12.72     100   12.800   11794     28      93       31    .077    2.1        7     2.4     28     16.0
5 19 HG       24    .020   11.04      48   11.085    7484     17      27       11    .057    1.0        2      .6      7     19.0
6 16 HG       33    .050   12.59      98   12.676   11794     33      94       30    .077    2.6        7     2.3     28     16.0
7  3 HG       37    .130   13.73     123   13.900   24222     70     458      100    .113    7.9       52    11.3    101      3.0
8 16 HG       24    .060   12.72      61   12.805   11794     23     112       19    .077    1.8        9     1.4     28     16.0
9 C.T.        33    .010    6.37      36    6.416    2177     12       7        4    .143    1.7        1      .6      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------   1.0        5     1.2
1 IDLE        30    .090   10.92      23   10.992    2132      6      16        5    .232    1.5        4     1.1      0     17.2
2 16 HG       30    .090   12.72      98   12.792   11794     30      74       30    .077    2.3        6     2.3     28     16.0
3 10 HG       30    .110   13.58     135   13.722   17237     41     279       56    .147    6.0       41     8.3     63     10.0
4 16 HG       23    .050   12.79      73   12.865   11794     23      93       22    .077    1.8        7     1.7     28     16.0
5 19 HG       19    .010   11.04      36   11.071    7484     14      14        8    .057     .8        1      .5      7     19.0
6 16 HG       28    .050   12.54      73   12.620   11794     28      94       23    .077    2.2        7     1.7     28     16.0
7  3 HG       37    .150   13.58     110   13.770   24222     70     533       64    .113    7.9       60     7.3    101      3.0
8 16 HG       23    .050   12.72      61   12.795   11794     23      93       19    .077    1.8        7     1.4     28     16.0
9 C.T.        29    .010    6.37      30    6.411    2177     11       7        3    .143    1.5        1      .5      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .9        5      .8
1 IDLE        23    .020   10.80      36   10.845    2132      5       8        2    .232    1.1        2      .5      0     17.2
2 16 HG       28    .030   12.54      97   12.650   11794     28      56       30    .077    2.2        4     2.3     28     16.0
3 10 HG       28    .100   13.54     123   13.710   17237     38     254       51    .147    5.6       37     7.5     63     10.0
4 16 HG       23    .040   12.72      73   12.785   11794     23      75       22    .077    1.8        6     1.7     28     16.0
5 19 HG       19    .010   11.16      36   11.192    7484     14      14        8    .057     .8        1      .5      7     19.0
6 16 HG       25    .050   12.72      73   12.797   11794     25      93       22    .077    1.9        7     1.7     28     16.0
7  3 HG       35    .130   13.73     106   13.898   24222     66     458       61    .113    7.4       52     6.9    101      3.0
8 16 HG       23    .050   12.80      73   12.875   11794     23      93       22    .077    1.8        7     1.7     28     16.0
9 C.T.        30    .010    6.45      36    6.492    2177     11       7        4    .143    1.6        1      .6      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .8        4      .8
1 IDLE        24    .020   10.80      36   10.845    2132      5       8        2    .232    1.1        2      .5      0     17.2
2 16 HG       28    .030   12.59      98   12.650   11794     28      56       30    .077    2.2        4     2.3     28     16.0
3 10 HG       28    .110   13.65     135   13.790   17237     38     278       56    .147    5.6       41     8.2     63     10.0
4 16 HG       23    .030   12.72      73   12.775   11794     23      56       22    .077    1.8        4     1.7     28     16.0
5 19 HG       20    .010   11.04      36   11.072    7484     15      14        8    .057     .8        1      .5      7     19.0
6 16 HG       25    .050   12.66      85   12.737   11794     25      94       26    .077    1.9        7     2.0     28     16.0
7  3 HG       35    .150   13.70     110   13.888   24222     66     528       64    .113    7.4       60     7.2    101      3.0
8 16 HG       20    .050   12.63      65   12.702   11794     20      94       20    .077    1.5        7     1.5     28     16.0
9 C.T.        30    .010    6.43      30    6.472    2177     11       7        3    .143    1.6        1      .5            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .8        4      .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------    .9        5     1.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------    .8        4      .8
FOUR CYCLE COMPOSITE =               HC= NDIR 0.35(    .9) + 0.65(    .8) =     .843   GM/BHP HR
                                     CO= NDIR 0.35(   4.5) + 0.65(   4.1) =    4.259   GM/BHP HR
                                     NO2=NDIR 0.35(   1.0) + 0.65(    .8) =     .874   GM/BHP HR
                                                        CORRECTED NO2 =     .813   GM/BHP HR
                                                                 BSFC =     .751   LB/BHP HR
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              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE        HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO      NO2    FACT.   HC-FID    CO   NO2-CL    HP     VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       207    .040   10.92      30   10.981    2132      4      16        2    .232     .9        4      .4            17.2
2 16 HG      244    .050   12.86     103   12.934   11794     22      92       31    .077    1.7        7     2.4     28     16.0
3 10 HG      326    .130   13.58     131   13.743   17237     41     329       55    .147    6.0       48     8.0     63     10.0
4 16 HG      189    .050   12.72      61   12.789   11794     17      93       19    .077    1.3        7     1.4     28     16.0
5 19 HG      117    .020   11.04      14   11.072    7484      8      27        3    .057     .5        2      .2      7     19.0
6 16 HG      236    .050   12.59      60   12.664   11794     22      94       19    .077    1.7        7     1.4     28     16.0
7  3 HG      353    .130   13.74     113   13.895   24222     62     458       65    .113    7.0       52     7.4    101      3.0
8 16 HG      133    .060   12.72      45   12.793   11794     12     112       11    .077     .9        9      .8     28     16.0
9 C.T.       308    .010    6.37      15    6.411    2177     10       7        2    .143    1.5        1      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .7        5      .8
1 IDLE       207    .040   10.92      30   10.981    2132      4      16        2    .232     .9        4      .4      0     17.2
2 16 HG      202    .040   12.72      63   12.780   11794     19      75       19    .077    1.4        6     1.5     28     16.0
3 10 HG      197    .110   13.58      94   13.710   17237     25     279       37    .147    3.6       41     5.4     63     10.0
4 16 HG      119    .050   12.74      42   12.852   11794     11      93       13    .077     .8        7     1.0     28     16.0
5 19 HG       86    .010   11.04       8   11.059    7484      6      14        2    .057     .3        1      .1      7     19.0
6 16 HG      178    .050   12.59      40   12.658   11794     17      94       12    .077    1.3        7     1.0     28     16.0
7  3 HG      334    .150   13.58      67   13.763   24222     59     533       39    .113    6.6       60     4.4    101      3.0
8 16 HG      121    .050   12.72      30   12.782   11794     11      93        9    .077     .9        7      .7     28     16.0
9 C.T.       282    .010    6.37      13    6.408    2177     10       7        1    .143    1.4        1      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .6        5      .5
1 IDLE       144    .020   10.80       4   10.833    2132      3       8        0    .232     .6        2      .1      0     17.2
2 16 HG      137    .030   12.59      62   12.640   11794     18      57       19    .077    1.4        4     1.5     28     16.0
3 10 HG      164    .100   13.58      94   13.697   17237     21     254       33    .147    3.1       37     4.9     63     10.0
4 16 HG      115    .040   12.72      40   12.778   11794     11      75       12    .077     .8        6      .9     28     16.0
5 19 HG       74    .010   11.16       6   11.178    7484      5      14        1    .057     .3        1      .1      7     19.0
6 16 HG      169    .050   12.72      39   12.787   11794     15      93       12    .077    1.2        7      .9     28     16.0
7  3 HG      305    .130   13.74      50   13.890   24222     53     458       29    .113    6.0       52     3.3    101      3.0
8 16 HG      112    .050   12.80      30   12.861   11794     10      93        9    .077     .8        7      .7     28     16.0
9 C.T.       271    .010    6.45      11    6.487    2177      9       7        1    .143    1.3        1      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .5        4      .4
1 IDLE       133    .020   10.80       4   10.833    2132      3       8        0    .232     .6        2      .1      0     17.2
2 16 HG      185    .030   12.59      63   12.630   11794     17      57       20    .077    1.3        4     1.5     28     16.0
3 10 HG      166    .110   13.65      85   13.777   17237     21     278       35    .147    3.0       41     5.2     63     10.0
4 16 HG      107    .040   12.72      38   12.761   11794     10      56       12    .077     .8        4      .9     28     16.0
5 19 HG       83    .010   11.04       6   11.058    7484      6      14        1    .057     .3        1      .1      7     19.0
6 16 HG      168    .050   12.66      38   12.727   11794     16      94       12    .077    1.2        7      .9     28     16.0
7  3 HG      411    .150   13.70      60   13.881   24222     54     529       35    .113    6.1       60     3.9    101      3.0
8 16 HG      112    .050   12.64      28   12.691   11794     10      94        9    .077     .8        7      .7     28     16.0
9 C.T.       285    .010    6.44      10    6.449    2177     10       7        1    .143    1.4        1      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------    .5        4      .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------    .7        5      .6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------    .5        4      .4
FOUR CYCLE COMPOSITE =               HC= FID  0.35(    .7) + 0.65(    .5) =     .569   GM/BHP HR
                                     CO= NDIR 0.35(   4.5) + 0.65(   4.1) =    4.262   GM/BHP HR
                                     NO2=CL   0.35(    .6) + 0.65(    .4) =     .501   GM/BHP HR
                                                        CORRECTED NO2 =     .466   GM/BHP HR
                                                                 BSFC =     .751   LB/BHP HR
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                        TABLE G-45. MASS EMISSIONS BY NINE-MODE FTP
ENGINE 7-1   TEST 129   P-1-3   W/T CAT. 20(F18-NOPY)  10-22-74       K = .919      HUM = 51.4  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR       MAN.
MODE        HC     CO     CO2     NO     CARBON   CONS.      HC     CO     NO2    FACT.   HC     CO    NO2   HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE      33    .020   11.11    36     11.976    2132
2 16 MG     30    .020   12.95   110     12.606   11794       6      7      2    .232    1.5     2    .5    0    17.2
3 10 MG     33    .080   13.50   192     13.696   17237      39     38     19    .077    2.5     3   2.7   28    16.0
4 16 MG     19    .030   12.46    60     12.501   11794      45    203     62    .147    6.6    30   9.1   63    10.0
5 19 MG     19    .020   11.28    36     11.321    7484      19     57     19    .077    1.5     4   1.4   28    16.0
6 16 MG     29    .090   12.45    98     12.516   11794      19     27      8    .057     .8     2    .5    7    19.0
7  3 MG     29    .150   13.59    85     13.760   24222      29     76     15    .077    1.9     6   1.2   28    16.0
8 16 MG     19    .090   12.45    98     12.511   11794      53    533     50    .113    6.0    60   5.6  101     3.0
9 C.T.      28    .010    6.95    29      6.990    2177      19     76     15    .077    1.5     6   1.2   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------  10      7      3    .143    1.5     1    .4    0    24.9
1 IDLE      33    .020   11.93    36     11.976    2132     ------------------------      .8     4    .8
2 16 MG     29    .090   12.31    61     12.476   11794       6      7      2    .232    1.5     2    .5    0    17.2
3 10 MG     29    .110   13.29    98     13.430   17237      25     77     19    .077    1.9     6   1.5   28    16.0
4 16 MG     19    .050   12.31    98     12.381   11794      39    285     92    .147    5.7    42   6.1   63    10.0
5 19 MG     19    .020   11.04    24     11.081    7484      20     96     15    .077    1.5     7   1.2   28    16.0
6 16 MG     23    .050   12.31    61     12.385   11794      19     27      5    .057     .8     2    .3    7    19.0
7  3 MG     33    .150   13.43   148     13.616   24222      24     96     19    .077    1.8     7   1.5   28    16.0
8 16 MG     19    .050   12.45    98     12.521   11794      63    539     87    .113    7.2    61   9.9  101     3.0
9 C.T.      24    .010    6.95    29      6.986    2177      19     95     15    .077    1.5     7   1.2   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   9      7      3    .143    1.2     1    .4    0    24.9
1 IDLE      19    .060   11.53    36     11.611    2132     ------------------------      .8     5    .8
2 16 MG     23    .030   12.31    98     12.365   11794       4     22      2    .232     .9     5    .5    0    17.2
3 10 MG     32    .060   13.29    98     13.385   17237      24     58     15    .077    1.8     4   1.2   28    16.0
4 16 MG     19    .090   12.45    98     12.511   11794      45    156     42    .147    6.5    23   6.2   63    10.0
5 19 MG     19    .010   10.92    29     10.951    7484      19     76     15    .077    1.5     6   1.2   28    16.0
6 16 MG     23    .090   12.31    98     12.376   11794      19     19      5    .057     .8     1    .3    7    19.0
7  3 MG     28    .110   13.43   148     13.570   24222      24     77     15    .077    1.8     6   1.2   28    16.0
8 16 MG     19    .090   12.45    36     12.511   11794      54    397     88    .113    6.1    45   9.9  101     3.0
9 C.T.      23    .010    6.95    12      6.985    2177      19     76     11    .077    1.5     6    .9   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   8      7      1    .143    1.2     1    .2    0    24.9
1 IDLE      19    .080   11.53    36     11.611    2132     ------------------------      .7     3    .7
2 16 MG     23    .050   12.45    73     12.525   11794       4     22      2    .232     .9     5    .5    0    17.2
3 10 MG     29    .170   13.43   123     13.626   17237      23     95     23    .077    1.8     7   1.8   28    16.0
4 16 MG     19    .060   12.16    98     12.241   11794      33    434     52    .147    4.8    64   7.6   63    10.0
5 19 MG     19    .020   10.33    24     10.371    7484      20    117     15    .077    1.5     9   1.2   28    16.0
6 16 MG     23    .060   12.59    61     12.675   11794      15     29      6    .057     .8     2    .3    7    19.0
7  3 MG     33    .250   13.58    98     13.866   24222      23    113     19    .077    1.8     9   1.5   28    16.0
8 16 MG     23    .060   12.59    61     12.675   11794      62    882     57    .113    7.0   100   6.4  101     3.0
9 C.T.      23    .010    6.37    29      6.405    2177      23    113     19    .077    1.8     9   1.5   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   9      7      3    .143    1.2     1    .4    0    24.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     .7     7    .7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     .8     4    .8
FOUR CYCLE COMPOSITE =                                                                 .7     5    .7
                          HC= NDIR 0.35(     .8) + 0.65(     .7) =     .754   GM/BHP HR
                          CO= NDIR 0.35(    4.2) + 0.65(    5.1) =    4.760   GM/BHP HR
                          NO2=NDIR 0.35(     .8) + 0.65(     .7) =     .729   GM/BHP HR
                                                  CORRECTED NO2 =     .666   GM/BHP HR
                                                           BSFC =     .751   LB/BHP HR


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            CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR      WT.       WEIGHTED GM/HR          MAN.
MODE        HC-FID   CO     CO2   NO-CL  CARBON   CONS.      HC     CO     NO2    FACT.  HC-FID   CO  NO2-CL  HP    VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE     153    .020   11.92    17     11.955    2132
2 16 MG    223    .020   12.45    85     12.492   11794       3      7      1    .232     .6     2    .2    0    17.2
3 10 MG    197    .080   13.58   120     13.680   17237      21     38     27    .077    1.6     3   2.1   28    16.0
4 16 MG    145    .030   12.45    39     12.494   11794      25    204     50    .147    3.7    30   7.4   63    10.0
5 19 MG    110    .020   11.28     8     11.311    7484      13     57     12    .077    1.0     4    .9   28    16.0
6 16 MG    182    .040   12.45    21     12.508   11794       7     27      2    .057     .4     2    .1    7    19.0
7  3 MG    269    .150   13.58    65     13.757   24222      17     76      7    .077    1.3     6    .5   28    16.0
8 16 MG    112    .040   12.45    15     12.501   11794      47    534     38    .113    5.3    60   4.3  101     3.0
9 C.T.     273    .010    6.45     5      6.487    2177      11     76      5    .077     .8     6    .4   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   9      7      1    .143    1.3     1    .1    0    24.9
1 IDLE     153    .020   11.92    17     11.955    2132     ------------------------      .6     4    .5
2 16 MG    167    .040   12.31    34     12.367   11794       3      7      1    .232     .6     2    .2    0    17.2
3 10 MG    197    .110   13.29    65     13.420   17237      16     77     11    .077    1.2     6    .8   28    16.0
4 16 MG    111    .053   12.31    26     12.371   11794      25    285     28    .147    3.7    42   4.1   63    10.0
5 19 MG     93    .020   11.04     9     11.068    7484      11     96      8    .077     .8     7    .6   28    16.0
6 16 MG    196    .040   12.31    31     12.375   11794       6     27      2    .057     .3     2    .1    7    19.0
7  3 MG    271    .150   13.43   105     13.607   24222      14     96     10    .077    1.1     7    .8   28    16.0
8 16 MG     84    .050   12.45    21     12.508   11794      48    539     62    .113    5.5    61   7.0  101     3.0
9 C.T.     199    .010    6.45     6      6.480    2177       8     95      7    .077     .6     7    .5   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   7      7      1    .143    1.0     1    .1    0    24.9
1 IDLE      47    .060   11.53     4     11.600    2132     ------------------------      .5     5    .5
2 16 MG    121    .030   12.31    31     12.353   11794       2     22      0    .232     .4     5    .1    0    17.2
3 10 MG    197    .060   13.29    60     13.370   17237      13     58     10    .077    1.0     4    .8   28    16.0
4 16 MG    149    .040   12.45    28     12.504   11794      25    156     26    .147    3.7    23   3.8   63    10.0
5 19 MG     59    .010   10.92     8     10.936    7484      13     76      9    .077    1.0     6    .7   28    16.0
6 16 MG    144    .040   12.31    29     12.364   11794       4     19      2    .057     .2     1    .1    7    19.0
7  3 MG    225    .110   13.43   113     13.567   24222      14     77      9    .077    1.1     6    .7   28    16.0
8 16 MG     79    .040   12.45    18     12.498   11794      49    397     67    .113    5.5    45   7.6  101     3.0
9 C.T.     185    .010    6.45     5      6.479    2177       7     76      6    .077     .6     6    .4   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   6      7      1    .143     .9     1    .1    0    24.9
1 IDLE      97    .060   11.53     4     11.600    2132     ------------------------      .5     3    .5
2 16 MG    115    .050   12.45    59     12.511   11794       2     22      0    .232     .4     5    .1    0    17.2
3 10 MG    197    .170   13.43    86     13.620   17237      11     95     17    .077     .8     7   1.3   28    16.0
4 16 MG     78    .060   12.16    38     12.228   11794      25    435     36    .147    3.7    64   5.3   63    10.0
5 19 MG     49    .020   10.33     5     10.354    7484       8    117     12    .077     .6     9    .9   28    16.0
6 16 MG    112    .060   12.59    34     12.661   11794       3     29      1    .057     .2     2    .1    7    19.0
7  3 MG    338    .250   13.58    73     13.864   24222      10    113     11    .077     .8     9    .8   28    16.0
8 16 MG     73    .060   12.59    38     12.657   11794      54    882     42    .113    6.2   100   4.8  101     3.0
9 C.T.     179    .010    6.37     8      6.398    2177       7    113     12    .077     .5     9    .9   28    16.0
----------------CYCLE COMPOSITE IN GM/BHP HR---------------   6      7      1    .143     .4     1    .1    0    24.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     .5     7    .5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     .5     4    .5
FOUR CYCLE COMPOSITE =                                                                 .5     5    .5
                          HC= FID  0.35(     .5) + 0.65(     .5) =     .498   GM/BHP HR
                          CO= NDIR 0.35(    4.2) + 0.65(    5.1) =    4.763   GM/BHP HR
                          NO2=CL   0.35(     .5) + 0.65(     .5) =     .489   GM/BHP HR
                                                  CORRECTED NO2 =     .447   GM/BHP HR
                                                           BSFC =     .751   LB/BHP HR
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                    TABLE G-46. [illegible] EMISSIONS BY NINE-MODE EPA
[illegible] TEST 112 [illegible] 1974 STANDARD        10-1-73       K =1.056      HUM = 95.4  GR/LB
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                   CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR               MAN.
MODE              HC      CO     CO2     NO    CARBON   CONS.      HC      CO     NO2   FACT.    HC       CO     NO2             VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE           616   1.121   10.68    111   12.455    1542      82     280      5   .232    19.1      65     1.1            16.7
2 30 PCT T       208   1.393   13.63   2253   14.356   11022     166    1548    551   .077    12.7     119    42.4            15.2
3 60 PCT T       133    .560   13.76   4431   14.519   16420     219    1280   1428   .147    32.2     188   217.3             9.0
4 30 PCT T       164   1.097   13.74   2254   14.951   11022     126    1549    577   .077     9.7     119    44.4     35     15.2
5 10 PCT T       104    .390   14.12    802   14.527    7348      59     438    135   .052     3.4      23     7.2     12     19.0
6 30 PCT T       151    .390   13.94   2564   14.352   11022     119    1474    628   .077     9.2     114    48.3     35     15.2
7 90 PCT T       141   1.150   13.15   1722   16.474   24442     259    3460    875   .113    29.2    1064    98.8            2.9
8 30 PCT T       138   1.300   13.49   2510   14.836   11022     108    1501    619   .077     8.3     116    47.7            15.2
9 C.T.          1455   1.240    7.54    143   10.929    1633     302     393      7   .143    43.2      56     1.0            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    4.9      55    14.9
1 IDLE           616   1.121   10.68    111   12.465    1542      82     280      5   .232    19.1      55     1.1            16.7
2 30 PCT T       200   1.360   13.63   2159   14.946   11022     159    1574    528   .077    12.3     122    40.7            15.2
3 60 PCT T       120    .480   13.69   4181   14.354   16420     210    1109   1588   .147    30.9     163   233.4             9.0
4 30 PCT T       153   1.093   13.64   2421   14.885   11022     122    1556    595   .077     9.4     120    45.8            15.2
5 10 PCT T       110    .393   14.31    834   14.519    7348      60     399    191   .052     3.4      23     8.0     13     19.0
6 30 PCT T       144   1.111   13.70   2447   15.060   11022     117    1641    609   .077     9.0     126    46.5     35     15.2
7 90 PCT T       161   2.880   13.23   1917   16.296   24442     245    8749    907   .113    29.9     989   102.5             2.9
8 30 PCT T       135   1.160   13.74   2593   15.046   11022     107    1717    628   .077     8.2     132    48.4            15.2
9 C.T.          1354   1.121    7.74    149   10.904    1633     286     357      7   .143    40.9      51     1.0            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    4.8      53    15.5
1 IDLE           410   1.320   11.44     96   13.203    1542      52     311      4   .232    12.0      72      .9            16.7
2 30 PCT T       177   1.220   13.63   2274   15.041   11022     140    1806    554   .077    10.8     139    42.7            15.2
3 60 PCT T       144    .520   13.73   4161   14.411   16420     183    1197   1576   .147    27.0     176   231.5             9.0
4 30 PCT T       146   1.143   13.69   2437   14.977   11022     108    1695    595   .077     8.3     130    45.8            15.2
5 10 PCT T        97    .330   14.15    931   14.525    7348      53     379    140   .052     3.0      23     8.0     12     19.0
6 30 PCT T       136   1.180   13.74   2471   15.067   11022     107    1744    600   .077     8.3     134    46.2            15.2
7 90 PCT T       151   2.710   13.34   1931   16.113   24442     248    8321    974   .113    28.0     940   110.1             2.9
8 30 PCT T       124   1.151   13.76   2504   15.068   11022     102    1699    609   .077     7.9     131    46.9            15.2
9 C.T.          1649   1.190    7.45    164   10.926    1633     275     361      8   .143    39.4      52     1.1            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    4.2      53    15.7
1 IDLE           410   1.320   11.44     96   13.203    1542      52     311      4   .232    12.0      72      .9            16.7
2 30 PCT T       166   1.140   13.44   2264   15.039   11022     131    1747    551   .077    10.1     135    42.4            15.2
3 60 PCT T       143    .540   13.76   4027   14.454   16420     175    1239   1538   .147    25.9     182   226.0             9.0
4 30 PCT T       132   1.140   13.74   2446   15.113   11022     104    1739    592   .077     8.0     134    45.6            15.2
5 10 PCT T        87    .400   14.05    804   14.544    7348      47     408    135   .052     2.7      23     7.2            19.0
6 30 PCT T       132   1.240   13.76   2413   15.143   11022     104    1823    583   .077     8.0     140    44.9            15.2
7 90 PCT T       145   2.530   13.31   1952   16.097   24442     238    8083    986   .113    26.9     913   111.4             2.9
8 30 PCT T       120   1.150   13.48   2482   14.970   11022      95    1725    608   .077     7.3     133    46.8            15.2
9 C.T.          1739   1.330    7.71    135   10.918    1633     291     402      7   .143    40.2      57     1.0            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    4.1      53    15.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------    4.9      54    15.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------    4.2      53    15.6
FOUR CYCLE COMPOSITE =
                                       HC= NDIR 0.35(    4.9) + 0.65(    4.2) =    4.426   GM/BHP HR
                                       CO= NDIR 0.35(   53.8) + 0.65(   52.7) =   53.063   GM/BHP HR
                                       NO2=NDIR 0.35(   15.2) + 0.65(   15.6) =   15.460   GM/BHP HR
                                                             CORRECTED NO2 =   16.313   GM/BHP HR
                                                                      BSFC =     .621   LB/BHP HR


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                   CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR               MAN.
MODE          HC-FID      CO     CO2  NO-CL    CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID     CO   NO-CL             VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE          8485   1.121   10.68     32   12.648    1542     103     276      1   .232    24.0      64      .3            16.7
2 30 PCT T      3324   1.040   13.63   2101   15.062   11022     243    1537    510   .077    18.7     118    39.4            15.2
3 60 PCT T      2831    .560   13.76   3807   14.603   16420     318    1272   1419   .147    46.8     187   194.5             9.0
4 30 PCT T      2558   1.040   13.74   2300   15.036   11022     182    1541    560   .077    14.4     119    43.1     35     15.2
5 10 PCT T      1303    .340   14.32    750   14.540    7348      66     392    126   .052     3.8      23     7.2            19.0
6 30 PCT T      2586    .490   14.40   2450   15.044   11022     189    1455    596   .077    14.6     113    45.9            15.2
7 90 PCT T      3222   3.150   13.15   1700   16.622   24442     475    9376    832   .113    53.6    1059    94.0            2.9
8 30 PCT T      2352   1.030   13.69   2350   14.426   11022     174    1492    576   .077    13.4     115    44.4            15.2
9 C.T.         23295   1.231    7.53     21   11.199    1633     347     381      1   .143    49.6      54      .1            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    7.0      54    14.2
1 IDLE          8485   1.121   10.68     32   12.648    1542     103     276      1   .232    24.0      64      .3            16.7
2 30 PCT T      3125   1.360   13.63   2003   15.342   11022     229    1553    487   .077    17.6     121    37.5            15.2
3 60 PCT T      2243    .480   13.69   4250   14.444   16420     312    1102   1608   .147    45.0     163   236.4             9.0
4 30 PCT T      2566   1.090   13.69   2300   14.476   11022     189    1546    567   .077    14.5     119    43.4            15.2
5 10 PCT T      1303    .331   14.31    751   14.540    7348      66     498    114   .052     3.8      23     6.7            19.0
6 30 PCT T      2617   1.111   13.74   2451   15.152   11022     190    1630    591   .077    14.6     126    45.5            15.2
7 90 PCT T      2831   2.880   13.23   1750   16.414   24442     437    8687    868   .113    49.4     982    98.0            2.9
8 30 PCT T      2304   1.161   13.76   2401   15.140   11022     168    1707    580   .077    12.9     131    44.7            15.2
9 C.T.         21644   1.171    7.76     24   11.025    1633     319     368      1   .143    45.6      56      .2            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    6.7      52    15.0
1 IDLE          2273   1.320   11.44     96   13.582    1542      96     303      2   .232    21.8      70      .4            16.7
2 30 PCT T      3156   1.220   13.64   2100   15.166   11022     229    1791    507   .077    17.7     138    39.0            15.2
3 60 PCT T      2245    .520   13.74   4100   14.528   16420     310    1187   1539   .147    45.6     175   226.2             9.0
4 30 PCT T      2554   1.141   13.69   2401   15.396   11022     187    1682    582   .077    14.4     130    44.8            15.2
5 10 PCT T      1303    .331   14.31    753   14.550    7348      66     377    126   .052     3.4      22     7.2            19.0
6 30 PCT T      2617   1.120   13.74   2301   15.142   11022     190    1731    554   .077    14.6     133    42.7            15.2
7 90 PCT T      2926   2.710   13.34   1801   16.343   24442     441    8254    901   .113    49.9     933   101.8            2.9
8 30 PCT T      2344   1.150   13.70   2351   15.143   11022     170    1699    567   .077    13.1     130    43.7            15.2
9 C.T.         22106   1.190    7.46     24   11.251    1633     321     349      1   .143    45.9      50      .2            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    6.7      52    14.9
1 IDLE          2273   1.320   11.44     96   13.582    1542      94     304      2   .232    21.8      70      .4            16.7
2 30 PCT T      3071   1.180   13.63   2152   15.167   11022     223    1732    519   .077    17.2     133    39.4            15.2
3 60 PCT T      2491    .541   13.76   4212   14.549   16420     281    1231   1579   .147    41.3     181   231.8             9.0
4 30 PCT T      2391   1.191   13.74   2301   15.209   11022     173    1722    553   .077    13.3     133    42.6            15.2
5 10 PCT T      1247    .400   14.05    803   14.525    7348      63     402    134   .052     3.6      23     7.0            19.0
6 30 PCT T      2449   1.240   13.76   2400   15.245   11022     177    1811    526   .077    13.6     139    40.4     35     15.2
7 90 PCT T      2464   2.530   13.31   1801   15.327   24442     433    8019    902   .113    48.9     906   101.9            2.9
8 30 PCT T      2388   1.161   13.48   2401   15.029   11022     175    1713    582   .077    13.4     132    44.8            15.2
9 C.T.         24273   1.331    7.71     24   11.467    1633     346     383      1   .143    49.4      55      .2            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------    6.5      52    15.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------    6.9      53    14.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------    6.6      52    15.0
FOUR CYCLE COMPOSITE =
                                       HC= FID  0.35(    6.9) + 0.65(    6.6) =    6.693   GM/BHP HR
                                       CO= NDIR 0.35(   53.3) + 0.65(   52.2) =   52.586   GM/BHP HR
                                       NO2=CL   0.35(   14.6) + 0.65(   15.0) =   14.847   GM/BHP HR
                                                             CORRECTED NO2 =   15.677   GM/BHP HR
                                                                      BSFC =     .621   LB/BHP HR
                    TABLE G-47. [illegible]
[illegible]   TEST 117 [illegible]                                  HUM = 83.1  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR      WT.       WEIGHTED GM/HR               MAN.
MODE          HC      CO     CO2     NO     CARBON   CONS.    HC     CO     NO2    FACT.   HC       CO     [illegible]    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE         442    .960  11.27     84   12.717    1542     58    235      4    .232    13.4      55      .8            16.7
2 30 PCT T     157   1.380  13.74   2281   15.280   11022    133   2010    546    .077     9.4     155    42.0     35     15.2
3 60 PCT T     127    .600  13.47   4149   14.557   16420    155   1366   1552    .147    22.7     201   228.2     71      9.0
4 30 PCT T     127   1.451  13.74   2366   15.322   11022     95   2197    560    .077     7.3     169    43.1     35     15.2
5 10 PCT T      81    .780  14.15    841   14.917    7348     43    581    138    .057     2.5      33     7.9     12     19.0
6 30 PCT T     124   1.500  13.71   2395   15.414   11022     96   2167    569    .077     7.4     167    43.8     35     15.2
7 90 PCT T     137   3.151  13.29   1584   16.417   24492    209   9194    843    .113    23.6    1038    95.1    106      2.9
8 30 PCT T     121   1.451  13.76   2432   15.441   11022     93   2105    576    .077     7.2     162    44.4     35     15.2
9 C.T.        1389   1.130   9.36    109   11.199    1633    220    362      5    .143    31.4      50      .8            24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.7      59    14.8
1 IDLE         442    .960  11.27     84   12.717    1542     58    235      4    .232    13.4      55      .8      0     16.7
2 30 PCT T     159   1.650  13.58   2105   15.395   11022    118   2396    519    .077     9.1     184    40.0     35     15.2
3 60 PCT T     124    .640  13.40   4232   14.654   16420    150   1539   1572    .147    22.1     226   231.2     71      9.0
4 30 PCT T     128   1.607  13.78   2921   15.519   11022     98   2296    571    .077     7.6     177    43.9     35     15.2
5 10 PCT T      91    .620  14.16    841   14.878    7348     49    619    138    .057     2.8      35     7.9     12     19.0
6 30 PCT T     125   1.620  13.73   2401   15.485   11022     96   2329    544    .077     7.4     179    41.9     35     15.2
7 90 PCT T     131   2.700  13.16   1924   16.200   24492    213   8245    965    .113    24.0     932   109.1    106      2.9
8 30 PCT T     121   1.570  13.76   2284   15.461   11022     93   2261    542    .077     7.2     174    41.7     35     15.2
9 C.T.        1324   1.123   8.79    119   11.250    1633    208    328      5    .143    29.7      47      .8      1     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.6      59    15.2
1 IDLE         584   1.120  11.56    102   13.223    1542     69    252      4    .232    16.0      58     1.0      0     16.7
2 30 PCT T     151   1.390  13.59   2211   15.553   11022    116   2434    521    .077     8.9     187    40.1     35     15.2
3 60 PCT T     127    .600  13.42   4231   14.557   16420    155   1367   1594    .147    22.7     201   235.1     71      9.0
4 30 PCT T     127   1.460  13.91   2371   15.407   11022     98   2110    563    .077     7.6     162    43.4     35     15.2
5 10 PCT T      96    .660  14.07    821   14.821    7348     45    461    143    .057     2.6      38     8.2     12     19.0
6 30 PCT T     127   1.530  13.72   2364   15.347   11022     98   2214    558    .077     7.6     170    43.0     35     15.2
7 90 PCT T     131   2.610  13.47   1964   16.120   24492    213   8010    991    .113    24.1     905   111.4    106      2.9
8 30 PCT T     121   1.490  13.71   2304   15.351   11022     94   2161    571    .077     7.2     166    44.4     35     15.2
9 C.T.        1371   1.290   8.61    134   11.411    1633    212    371      7    .143    30.3      53      .9      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.7      57    15.5
1 IDLE         559   1.170  11.56    104   13.221    1542     64    242      4    .232    16.0      58     1.0      0     16.7
2 30 PCT T     162   1.530  13.74   2217   15.444   11022    125   2206    525    .077     9.6     170    40.4     35     15.2
3 60 PCT T     143    .577  13.40   4243   14.710   16420    157   1511   1572    .147    23.0     222   231.1     71      9.0
4 30 PCT T     134   1.511  13.66   2425   15.405   11022    104   2312    576    .077     8.0     178    44.4     35     15.2
5 10 PCT T      96    .650  14.14    811   14.934    7348     51    546    132    .057     2.9      31     7.6     12     19.0
6 30 PCT T     131   1.510  13.72   2303   15.451   11022    101   2320    547    .077     7.8     179    42.1     35     15.2
7 90 PCT T     138   2.590  13.33   1925   16.125   24492    220   8353    931    .113    24.9     933   105.2    106      2.9
8 30 PCT T     127   1.500  13.76   2432   15.497   11022     98   2299    574    .077     7.5     177    44.2     35     15.2
9 C.T.        1311   1.210   8.71    134   11.336    1633    204    352      4    .143    29.2      50      .9      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     3.8      59    15.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------     3.6      59    15.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------     3.8      58    15.4
FOUR CYCLE COMPOSITE =              HC= NDIR 0.35(     3.6) + 0.65(     3.8) =   3.719   GM/BHP HR
                                    CO= NDIR 0.35(    59.2) + 0.65(    58.0) =  58.414   GM/BHP HR
                                    NO2=NDIR 0.35(    15.0) + 0.65(    15.4) =  15.273   GM/BHP HR
                                                        CORRECTED NO2 =  15.652   GM/BHP HR
                                                                 BSFC =    .621   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL    FUEL     CALCULATED GM/HR      WT.       WEIGHTED GM/HR               MAN.
MODE          HC-FID  CO     CO2   NO-CL    CARBON   CONS.    HC     CO     NO2    FACT.  HC-FID     CO   NO2-CL    HP    VAC.
-----------------------------------------------------------------------------------------------------------------------
1 IDLE        8033    .960  11.27     43   13.033    1542     95    228      2    .232    22.1      53      .4      0     16.7
2 30 PCT T    3306   1.380  13.74   2100   15.451   11022    236   1989    487    .077    18.2     153    38.3     35     15.2
3 60 PCT T    2666    .600  13.43   4100   14.696   16420    288   1356   1521    .147    41.7     199   223.6     71      9.0
4 30 PCT T    2703   1.450  13.74   2200   15.960   11022    193   2088    521    .077    14.8     161    40.1     35     15.2
5 10 PCT T    1613    .580  14.15    740   14.991    7348     80    530    125    .057     4.5      31     7.1     12     19.0
6 30 PCT T    2825   1.500  13.74   2230   15.562   11022    200   2144    524    .077    15.4     165    40.4     35     15.2
7 90 PCT T    3049   3.150  13.24   1600   16.535   24492    450   9094    784    .113    50.9    1027    88.6    106      2.9
8 30 PCT T    2683   1.460  13.86   2301   15.478   11022    190   2087    540    .077    14.6     161    41.6     35     15.2
9 C.T.       22438   1.190   8.36     23   11.894    1633    309    330      1    .143    44.1      47      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.7      59    14.1
1 IDLE        8033    .960  11.27     43   13.033    1542     95    229      2    .232    22.1      53      .4      0     16.7
2 30 PCT T    3325   1.650  13.58   2040   15.563   11022    236   2361    480    .077    18.1     182    36.9     35     15.2
3 60 PCT T    2654    .640  13.44   4250   14.285   16420    295   1525   1567    .147    43.3     224   230.4     71      9.0
4 30 PCT T    2421   1.600  13.78   2330   15.662   11022    199   2274    537    .077    15.3     175    41.3     35     15.2
5 10 PCT T    1796    .620  14.16    740   14.960    7348     88    615    124    .057     5.0      35     7.1     12     19.0
6 30 PCT T    2706   1.620  13.73   2150   15.629   11022    193   2308    503    .077    15.1     175    38.8     35     15.2
7 90 PCT T    2929   2.700  13.36   1890   16.353   24492    439   8149    895    .113    49.6     923   101.1    106      2.9
8 30 PCT T    2699   1.570  13.76   2150   15.530   11022    184   2243    505    .077    14.1     173    38.9     35     15.2
9 C.T.       19762   1.120   8.30     24   11.696    1633    262    416      1    .143    37.5      45      .2      1     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.5      59    14.5
1 IDLE        9488   1.070  11.56     44   13.479    1542     97    247      2    .232    22.5      57      .4      0     16.7
2 30 PCT T    3162   1.700  13.58   2080   15.696   11022    215   2411    485    .077    16.6     186    37.4     35     15.2
3 60 PCT T    2658    .601  13.32   4250   14.696   16420    297   1355   1578    .147    43.7     199   231.9     71      9.0
4 30 PCT T    2682   1.460  13.91   2240   15.538   11022    190   2092    525    .077    14.6     161    40.4     35     15.2
5 10 PCT T    1591    .660  14.07    740   14.889    7348     79    658    129    .057     4.5      38     7.4     12     19.0
6 30 PCT T    2739   1.530  13.72   2220   15.524   11022    194   2194    523    .077    15.0     169    40.3     35     15.2
7 90 PCT T    2870   2.610  13.47   1920   16.267   24492    432   7938    910    .113    48.8     897   102.8    106      2.9
8 30 PCT T    2533   1.490  13.71   2270   15.473   11022    181   2144    537    .077    13.9     165    41.3     35     15.2
9 C.T.       21835   1.290   8.61     32   12.109    1633    295    352      1    .143    42.1      50      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.6      56    14.8
1 IDLE        9488   1.070  11.56     44   13.479    1542     97    247      2    .232    22.5      57      .4      0     16.7
2 30 PCT T    3199   1.530  13.74   2060   15.580   11022    219   2186    484    .077    16.9     168    37.3     35     15.2
3 60 PCT T    2496    .671  13.90   4200   14.820   16420    277   1500   1595    .147    40.7     220   234.1     71      9.0
4 30 PCT T    2339   1.600  13.66   2300   15.534   11022    194   2293    542    .077    15.0     177    41.7     35     15.2
5 10 PCT T    1666    .650  14.18    740   14.897    7348     82    643    120    .057     4.7      37     6.8     12     19.0
6 30 PCT T    2311   1.510  13.70   2200   15.541   11022    192   2301    517    .077    14.8     177    39.8     35     15.2
7 90 PCT T    2421   2.490  13.39   1800   16.267   24492    432   8181    900    .113    48.8     924   101.7    106      2.9
8 30 PCT T    2644   1.510  13.76   2300   15.628   11022    199   2279    539    .077    14.6     176    41.5     35     15.2
9 C.T.       23089   1.210   8.71     24   11.929    1633    275    335      1    .143    39.3      48      .2      0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------     6.4      58    14.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------     6.6      59    14.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------     6.4      57    14.7
FOUR CYCLE COMPOSITE =              HC= FID  0.35(     6.6) + 0.65(     6.4) =   6.497   GM/BHP HR
                                    CO= NDIR 0.35(    58.6) + 0.65(    57.4) =  57.811   GM/BHP HR
                                    NO2=CL   0.35(    14.3) + 0.65(    14.7) =  14.550   GM/BHP HR
                                                        CORRECTED NO2 =  14.911   GM/BHP HR
                                                                 BSFC =    .621   LB/BHP HR
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                         TABLE G-48. '48 EMISSIONS BY NINE-MODE EPA
ENGINE 2400 TEST 112 ROUTE 1974 STANDARD        10 16 73     X 91,009     HUM = 77.4 GR/LB
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               CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE            HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2   FACT.     HC      CO     NO2    HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         583    .420   10.84     85   12.346    1542      78     219       4   .232     18.4     51      .8     0     16.7
2 30 PCT T     167   1.410   13.66   2191   15.250   11022     130    2058     526   .077     10.0    159    40.5    35     15.2
3 60 PCT T     133    .520   13.80   4080   14.570   16420     169    1411    1527   .147     24.8    207   224.5    71      9.0
4 30 PCT T     140   1.460   13.65   2401   15.250   11022     101    2131     576   .077      7.8    164    44.4    35     15.2
5 10 PCT T      86    .620   14.03    864   14.732    7348      46     625     143   .057      2.6     36     8.2    12     19.0
6 30 PCT T     128   1.390   13.76   2415   15.289   11022     100    2024     578   .077      7.7    156    44.5    35     15.2
7 90 PCT T     135   3.310   13.15   1721   16.306   24492     219    9133     858   .113     24.7   1032    97.0   106      2.9
8 30 PCT T     123   1.493   13.72   2443   15.343   11022      95    2162     583   .077      7.3    166    44.9    35     15.2
9 C.T.        1468   1.120    8.27    115   10.975    1633     236     337       6   .143     33.7     48      .8     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      4.0     59    14.8
1 IDLE         589    .420   10.84     85   12.346    1542      78     219       4   .232     18.4     51      .8     0     16.7
2 30 PCT T     169   1.580   13.63   2751   15.383   11022     124    2287     654   .077      9.5    176    50.4    35     15.2
3 60 PCT T     133    .500   13.62   4191   14.261   16420     163    1163    1602   .147     23.9    171   235.5    71      9.0
4 30 PCT T     125   1.530   13.60   2391   15.356   11022      98    2218     555   .077      7.6    171    42.8    35     15.2
5 10 PCT T      81    .580   14.10    888   14.767    7348      44     583     147   .057      2.5     33     8.4    12     19.0
6 30 PCT T     131   1.770   13.62   2269   15.531   11022     100    2537     535   .077      7.7    195    41.2    35     15.2
7 90 PCT T     128   2.630   13.33   1983   16.098   24492     210    8083     971   .113     23.8    913   109.8   106      2.9
8 30 PCT T     124   1.630   13.71   2389   15.474   11022      95    2395     564   .077      7.3    181    43.4    35     15.2
9 C.T.        1393   1.190    8.38    186   11.074    1633     222     354       6   .143     31.7     51      .9     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.9     57    15.7
1 IDLE         552   1.180   10.91    103   12.686    1542      72     290       4   .232     16.4     67     1.0     0     16.7
2 30 PCT T     156   1.650   13.59   2238   15.408   11022     121    2384     531   .077      9.3    184    40.9    35     15.2
3 60 PCT T     122    .640   13.81   4245   14.582   16420     148    1456    1587   .147     21.9    214   233.3    71      9.0
4 30 PCT T     126   1.600   13.66   2419   15.396   11022      97    2314     575   .077      7.5    178    44.3    35     15.2
5 10 PCT T      82    .620   14.07    908   14.770    7348      44     623     150   .057      2.5     35     8.5    12     19.0
6 30 PCT T     123   1.620   13.70   2396   15.459   11022      99    2333     567   .077      7.6    180    43.7    35     15.2
7 90 PCT T     132   2.660   13.27   1982   16.073   24492     217    8188     972   .113     24.5    925   109.9   106      2.9
8 30 PCT T     123   1.643   13.59   2425   15.363   11022      95    2377     578   .077      7.3    183    44.5    35     15.2
9 C.T.        1288   1.140    8.51    139   11.041    1633     206     341       7   .143     29.4     49     1.0     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.7     59    15.5
1 IDLE         552   1.180   10.91    103   12.686    1542      72     290       4   .232     16.8     67     1.0     0     16.7
2 30 PCT T     166   1.620   13.56   2269   15.359   11022     129    2348     541   .077      9.9    181    41.6    35     15.2
3 60 PCT T     130    .730   13.78   4147   14.650   16420     157    1653    1543   .147     23.1    243   226.8    71      9.0
4 30 PCT T     131   1.620   13.60   2425   15.361   11022     102    2349     578   .077      7.8    181    44.5    35     15.2
5 10 PCT T      89    .630   13.94    892   14.665    7348      48     638     148   .057      2.7     36     8.5    12     19.0
6 30 PCT T     129   1.570   13.57   2383   15.279   11022     101    2288     571   .077      7.7    176    43.9    35     15.2
7 90 PCT T     131   2.730   13.12   1858   15.991   24492     217    8446     985   .113     24.5    954   106.8   106      2.9
8 30 PCT T     123   1.551   13.68   2480   15.363   11022      95    2246     591   .077      7.3    173    45.5    35     15.2
9 C.T.        1276   1.070    8.28    130   10.728    1633     210     328       7   .143     30.0     47      .9     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      3.8     60    15.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      4.0     59    15.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      3.8     60    15.4
FOUR CYCLE COMPOSITE =                 HC= NDIR 0.35(    4.0) + 0.65(    3.8) =    3.860   GM/BHP HR
                                       CO= NDIR 0.35(   59.2) + 0.65(   59.8) =   59.271   GM/BHP HR
                                       NO2-NDIR 0.35(   15.3) + 0.65(   15.4) =   15.333   GM/BHP HR
                                                          CORRECTED NO2 =   15.462   GM/BHP HR
                                                                   BSFC =     .621   LB/BHP HR
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               CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.       WEIGHTED GM/HR             MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC      CO     NO2   FACT.   HC-FID    CO   NO2-CL   HP     VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE        9365    .420   10.84     37   12.647    1542     119     219       1   .232     26.5     50      .3     0     16.7
2 30 PCT T    3390   1.410   13.66   2050   15.409   11022     242    2037     487   .077     18.7    157    37.5    35     15.2
3 60 PCT T    2833    .620   13.80   4050   14.703   16420     316    1399    1502   .147     46.5    206   220.7    71      9.0
4 30 PCT T    2474   1.460   13.65   2359   15.398   11022     206    2111     558   .077     15.9    163    43.0    35     15.2
5 10 PCT T.   1203    .620   14.03    850   14.810    7348      84     621     140   .057      4.8     35     8.0    12     19.0
6 30 PCT T    2860   1.390   13.76   2300   15.435   11022     204    2005     545   .077     15.7    154    42.0    35     15.2
7 90 PCT T    3276   3.010   13.15   1650   16.489   24492     487    9032     814   .113     55.0   1021    92.0   106      2.9
8 30 PCT T    2453   1.490   13.72   2300   15.495   11022     203    2141     543   .077     15.6    165    41.8    35     15.2
9 C.T.       22607   1.120    8.27     23   11.651    1633     317     317       1   .143     45.3     45      .1     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      7.2     59    14.3
1 IDLE        9365    .420   10.84     37   12.647    1542     119     219       1   .232     26.5     50      .3     0     16.7
2 30 PCT T    3379   1.580   13.53   2000   15.538   11022     233    2264     471   .077     17.9    174    36.3    35     15.2
3 60 PCT T    2742    .500   13.62   4150   14.394   16420     313    1152    1572   .147     46.0    169   231.0    71      9.0
4 30 PCT T    2234   1.530   13.60   2200   15.496   11022     195    2194     520   .077     15.0    169    40.0    35     15.2
5 10 PCT T    1619    .580   14.10    800   14.842    7348      80     580     131   .057      4.6     33     7.5    12     19.0
6 30 PCT T    2470   1.770   13.62   2150   15.687   11022     209    2512     502   .077     16.1    193    38.6    35     15.2
7 90 PCT T    2326   2.630   13.33   1800   16.253   24492     441    8006     901   .113     49.8    905   101.8   106      2.9
8 30 PCT T    2364   1.630   13.71   2250   15.637   11022     209    2321     527   .077     16.1    179    40.5    35     15.2
9 C.T.       21229   1.190    8.38     20   11.747    1633     303     334       1   .143     43.3     48      .1     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      6.9     56    14.6
1 IDLE        9117   1.180   10.91     42   13.002    1542     108     283       2   .232     25.1     66      .4     0     16.7
2 30 PCT T    3138   1.650   13.59   2100   15.554   11022     223    2162     494   .077     17.1    182    38.0    35     15.2
3 60 PCT T    2644    .640   13.81   4200   14.699   16420     279    1494    1558   .147     41.0    212   229.0    71      9.0
4 30 PCT T    2642   1.600   13.66   2300   15.528   11022     190    2294     542   .077     14.7    177    41.7    35     15.2
5 10 PCT T    1562    .620   14.07    800   14.846    7348      77     620     131   .057      4.4     35     7.5    12     19.0
6 30 PCT T    2768   1.621   13.70   2300   15.597   11022     196    2313     540   .077     15.1    178    41.6    35     15.2
7 90 PCT T    3012   2.661   13.27   1900   16.231   24492     456    8110     952   .113     51.4    916   107.6   106      2.9
8 30 PCT T    2624   1.641   13.59   2250   15.492   11022     187    2357     531   .077     14.4    181    40.9    35     15.2
9 C.T.       19607   1.140    8.51     23   11.611    1633     276     324       1   .143     39.4     46      .2     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      6.5     59    14.9
1 IDLE        9117   1.180   10.91     42   13.002    1542     108     283       2   .232     25.1     66      .4     0     16.7
2 30 PCT T    2465   1.620   13.56   2100   15.477   11022     211    2331     497   .077     16.3    179    38.2    35     15.2
3 60 PCT T    2562    .730   13.79   4300   14.765   16420     284    1640    1588   .147     41.7    241   233.4    71      9.0
4 30 PCT T    2338   1.620   13.61   2300   15.494   11022     195    2328     543   .077     15.0    179    41.8    35     15.2
5 10 PCT T    1645    .630   13.94    850   14.738    7348      82     635     141   .057      4.7     36     8.0    12     19.0
6 30 PCT T    2422   1.570   13.57   2250   15.422   11022     202    2267     534   .077     15.6    175    41.1    35     15.2
7 90 PCT T    2424   2.730   13.12   1800   16.142   24492     444    8367     907   .113     50.1    945   102.6   106      2.9
8 30 PCT T    2219   1.560   13.68   2350   15.501   11022     193    2226     555   .077     14.8    171    42.7    35     15.2
9 C.T.       22209   1.070    8.28     22   11.371    1633     290     319       1   .143     41.6     44      .1     0     24.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      6.6     60    14.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      7.0     58    14.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      6.6     59    14.8
FOUR CYCLE COMPOSITE =                 HC= FID  0.35(    7.0) + 0.65(    6.6) =    6.734   GM/BHP HR
                                       CO= NDIR 0.35(   57.5) + 0.65(   59.2) =   58.639   GM/BHP HR
                                       NO2-CL   0.35(   14.4) + 0.65(   14.9) =   14.741   GM/BHP HR
                                                          CORRECTED NO2 =   14.866   GM/BHP HR
                                                                   BSFC =     .621   LB/BHP HR
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                    TABLE G-49. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 7-U   TEST 96  RUN-1   1973 CALIF ENGINE     09-13-73      K =1.049      HUM = 92.5  GR/LB
------------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED    TOTAL     FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR             MAN.
MODE             HC      CO     CO2      NO   CARBON    CONS.      HC       CO      NO2    FACT.    HC        CO     NO2      HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE          435    .900    9.86      62   11.230     2359      99      382        4    .232    22.9        89     1.0      0    17.3
2 30 PCT T       89    .220   11.80     727   12.116    11703      93      429      233    .077     7.1        33    18.0     35    14.4
3 60 PCT T       64    .670   13.21    1204   13.965    18507      99     1795      530    .147    14.5       264    77.9     70     8.9
4 30 PCT T       59    .190   11.86     830   12.114    11703      62      371      266    .077     4.7        29    20.5     35    14.4
5 10 PCT T       53    .200   14.00     371   14.257     8301      33      235       72    .057     1.9        13     4.1     12    17.8
6 30 PCT T       53    .190   11.92     824   12.167    11703      55      369      263    .077     4.2        28    20.3     35    14.4
7 90 PCT T       53   1.330   13.36    1252   14.747    25175      98     4586      710    .113    11.0       518    80.2    106     2.8
8 30 PCT T       45    .180   11.87     865   12.094    11703      47      352      278    .077     3.6        27    21.4     35    14.4
9 C.T.         1735    .510    9.08     108   11.964     2631     430      236        8    .143    61.5        34     1.2      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.9        31     7.2
1 IDLE          435    .900    9.86      62   11.230     2359      99      382        4    .232    22.9        89     1.0      0    17.3
2 30 PCT T       72    .190   12.00     796   12.268    11703      74      366      252    .077     5.7        28    19.4     35    14.4
3 60 PCT T       54    .450   13.51    1366   14.018    18507      77     1209      599    .147    11.3       176    88.0     70     8.9
4 30 PCT T       47    .170   12.08     866   12.301    11703      48      327      274    .077     3.7        25    21.1     35    14.4
5 10 PCT T       40    .200   14.35     420   14.591     8301      26      230       79    .057     1.4        13     4.5     12    17.8
6 30 PCT T       41    .180   12.14     872   12.364    11703      42      344      274    .077     3.2        26    21.1     35    14.4
7 90 PCT T       41   1.200   13.89    1294   15.094    25175      74     4056      719    .113     8.4       458    81.2    106     2.8
8 30 PCT T       36    .160   12.07     877   12.269    11703      37      308      278    .077     2.9        24    21.4     35    14.4
9 C.T.         1634    .530    9.66     146   11.955     2631     388      236       11    .143    55.5        34     1.5      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.4        26     7.7
1 IDLE          232    .720   10.01      56   10.981     2359      54      312        4    .232    12.5        72      .9      0    17.3
2 30 PCT T       66    .180   12.01     805   12.261    11703      68      347      255    .077     5.2        27    19.6     35    14.4
3 60 PCT T       48    .390   13.37    1522   13.812    18507      69     1056      677    .147    10.2       155    99.5     70     8.9
4 30 PCT T       42    .160   12.08     880   12.285    11703      43      308      278    .077     3.3        24    21.4     35    14.4
5 10 PCT T       38    .200   14.35     460   14.591     8301      23      230       87    .057     1.3        13     5.0     12    17.8
6 30 PCT T       38    .190   12.20     917   12.431    11703      39      361      287    .077     3.0        28    22.1     35    14.4
7 90 PCT T       38   1.060   13.87    1358   14.971    25175      69     3601      758    .113     7.8       407    85.7    106     2.8
8 30 PCT T       35    .150   12.06     949   12.248    11703      36      290      301    .077     2.8        22    23.2     35    14.4
9 C.T.         1698    .580    9.91     165   12.324     2631     392      250       12    .143    56.0        36     1.7      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.0        23     8.3
1 IDLE          232    .720   10.01      56   10.981     2359      54      312        4    .232    12.5        72      .9      0    17.3
2 30 PCT T       61    .200   12.12     767   12.386    11703      62      382      241    .077     4.8        29    18.6     35    14.4
3 60 PCT T       45    .400   13.46    1463   13.909    18507      65     1075      646    .147     9.5       158    95.0     70     8.9
4 30 PCT T       40    .160   12.01     820   12.213    11703      41      310      261    .077     3.2        24    20.1     35    14.4
5 10 PCT T       35    .250   14.36     420   14.648     8301      21      286       79    .057     1.2        16     4.5     12    17.8
6 30 PCT T       36    .210   12.21     882   12.459    11703      37      398      275    .077     2.8        31    21.2     35    14.4
7 90 PCT T       37   1.120   13.80    1361   14.960    25175      67     3807      760    .113     7.6       430    85.9    106     2.8
8 30 PCT T       34    .170   12.14     893   12.347    11703      35      325      281    .077     2.7        25    21.6     35    14.4
9 C.T.         1638    .480    9.44     102   11.689     2631     398      218        8    .143    56.9        31     1.1      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.0        24     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     3.7        28     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     3.0        24     8.1
FOUR CYCLE COMPOSITE -
                                     HC- NDIR 0.35(    3.7) + 0.65(     3.0) =     3.239   GM/BHP HR
                                     CO- NDIR 0.35(   28.3) + 0.65(    23.7) =    25.330   GM/BHP HR
                                     NO2-NDIR 0.35(    7.5) + 0.65(     8.1) =     7.893   GM/BHP HR
                                                        CORRECTED NO2 =     8.279   GM/BHP HR
                                                                 BSFC =      .691   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL     FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR             MAN.
MODE          HC-FID     CO     CO2   NO-CL   CARBON    CONS.      HC       CO      NO2    FACT.  HC-FID      CO   NO2-CL     HP    VAC.
------------------------------------------------------------------------------------------------------------------
1 IDLE         2441    .900    9.86      20   11.004     2359      52      390        1    .232    12.1        90      .3      0    17.3
2 30 PCT T      236    .220   11.80     655   12.044    11703      23      432      211    .077     1.8        33    16.3     35    14.4
3 60 PCT T      201    .670   13.21    1113   13.900    18507      27     1802      492    .147     3.9       265    72.3     70     8.9
4 30 PCT T      139    .190   11.86     763   12.064    11703      13      372      246    .077     1.0        29    18.9     35    14.4
5 10 PCT T       81    .200   14.00     312   14.208     8301       5      236       61    .057      .3        13     3.5     12    17.8
6 30 PCT T      126    .190   11.92     750   12.123    11703      12      371      240    .077      .9        29    18.5     35    14.4
7 90 PCT T      185   1.330   13.36    1075   14.709    25175      32     4598      611    .113     3.6       520    69.0    106     2.8
8 30 PCT T       96    .180   11.87     788   12.060    11703       9      353      254    .077      .7        27    19.5     35    14.4
9 C.T.        26564    .510    9.08      35   12.246     2631     571      221        2    .143    81.6        32      .3      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.1        31     6.5
1 IDLE         2441    .900    9.86      20   11.004     2359      52      390        1    .232    12.1        90      .3      0    17.3
2 30 PCT T      278    .190   12.00     655   12.218    11703      27      368      208    .077     2.1        28    16.0     35    14.4
3 60 PCT T      187    .450   13.51    1300   13.979    18507      25     1203      571    .147     3.6       177    84.0     70     8.9
4 30 PCT T      136    .170   12.08     763   12.264    11703      13      328      242    .077     1.0        25    18.6     35    14.4
5 10 PCT T       85    .200   14.35     350   14.559     8301       5      230       66    .057      .3        13     3.8     12    17.8
6 30 PCT T      115    .180   12.14     775   12.331    11703      11      345      244    .077      .8        27    18.8     35    14.4
7 90 PCT T      149   1.200   13.80    1150   15.015    25175      25     4064      640    .113     2.8       459    72.3    106     2.8
8 30 PCT T       96    .160   12.07     800   12.239    11703       9      309      254    .077      .7        24    19.6     35    14.4
9 C.T.        27575    .530    9.66      30   12.948     2631     560      218        2    .143    80.1        31      .3      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.1        26     6.9
1 IDLE         2199    .720   10.01      30   10.950     2359      47      313        2    .232    11.0        73      .5      0    17.3
2 30 PCT T      249    .180   12.01     710   12.215    11703      23      348      226    .077     1.8        27    17.4     35    14.4
3 60 PCT T      187    .390   13.37    1325   13.779    18507      25     1058      591    .147     3.7       156    86.9     70     8.9
4 30 PCT T      132    .160   12.08     788   12.253    11703      13      309      250    .077     1.0        24    19.2     35    14.4
5 10 PCT T       95    .200   14.35     350   14.560     8301       5      230       66    .057      .3        13     3.8     12    17.8
6 30 PCT T      121    .190   12.20     800   12.402    11703      11      362      251    .077      .9        28    19.3     35    14.4
7 90 PCT T      139   1.060   13.87    1188   14.944    25175      23     3607      664    .113     2.6       408    75.1    106     2.8
8 30 PCT T      101    .150   12.06     838   12.220    11703      10      290      266    .077      .7        22    20.5     35    14.4
9 C.T.        27206    .580    9.91      30   13.211     2631     542      233        2    .143    77.5        33      .3      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.0        23     7.2
1 IDLE         2199    .720   10.01      30   10.950     2359      47      313        2    .232    11.0        73      .5      0    17.3
2 30 PCT T      241    .200   12.12     765   12.344    11703      23      383      241    .077     1.8        29    18.5     35    14.4
3 60 PCT T      179    .400   13.46    1350   13.878    18507      24     1078      598    .147     3.5       158    87.9     70     8.9
4 30 PCT T      137    .160   12.01     890   12.184    11703      13      310      255    .077     1.0        24    19.6     35    14.4
5 10 PCT T      100    .250   14.36     375   14.620     8301       6      287       71    .057      .3        16     4.0     12    17.8
6 30 PCT T      126    .210   12.21     838   12.433    11703      12      399      262    .077      .9        31    20.2     35    14.4
7 90 PCT T      149   1.120   13.80    1212   14.935    25175      25     3814      678    .113     2.8       431    76.6    106     2.8
8 30 PCT T       94    .170   12.14     850   12.319    11703       9      326      268    .077      .7        25    20.6     35    14.4
9 C.T.        24892    .480    9.44      30   12.409     2631     528      206        2    .143    75.5        29      .3      0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     2.9        24     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     3.1        28     6.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     2.9        24     7.3
FOUR CYCLE COMPOSITE -
                                     HC- FID  0.35(    3.1) + 0.65(     2.9) =     2.986   GM/BHP HR
                                     CO- NDIR 0.35(   28.3) + 0.65(    23.7) =    25.339   GM/BHP HR
                                     NO2-CL   0.35(    6.7) + 0.65(     7.3) =     7.081   GM/BHP HR
                                                        CORRECTED NO2 =     7.427   GM/BHP HR
                                                                 BSFC =      .691   LB/BHP HR
                    TABLE G-50, MASS EMISSIONS BY NINE-MODE EPA
ENGINE-70   TEST-46  RUN-2    1973 CALIF ENGINE      09-13-73       K =1.068     HUM =101.1  GR/LB
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             CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2     NO   CARBON    CONS.       HC      CO     NO2   FACT.    HC        CO     NO2    HP   VAC.
------------------------------------------------------------------------------------------------------
1 IDLE        581    .590    9.34     71   10.557     2359      140     266       5    .232    32.5       62     1.2     0   17.3
2 30 PCT T     84    .180   11.67    757   11.991    11703       84     356     246    .077     6.5       27    19.0    35   14.9
3 60 PCT T     60    .980   13.28    911   14.325    18507       84    2558     391    .147    12.3      376    57.5    70    8.9
4 30 PCT T     59    .130   11.69    874   11.878    11703       57     259     288    .077     4.4       20    22.1    35   14.9
5 10 PCT T     47    .180   13.87    349   14.101     8301       30     214      78    .057     1.7       12     4.4    12   17.8
6 30 PCT T     49    .150   11.79    863   11.993    11703       52     296     280    .077     4.0       23    21.5    35   14.9
7 90 PCT T     47   1.060   13.36   1340   14.471    25175       88    3725     774    .113    10.0      421    87.5   106    2.8
8 30 PCT T     44    .130   11.70    897   11.878    11703       47     259     293    .077     3.6       20    22.6    35   14.9
9 C.T.       1708    .470    8.99    116   11.298     2631      428     221       9    .143    61.2       32     1.3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     4.0       29     7.0
1 IDLE        581    .590    9.34     71   10.557     2359      140     266       5    .232    32.5       62     1.2     0   17.3
2 30 PCT T     70    .160   11.72    789   11.956    11703       74     316     256    .077     5.7       24    19.7    35   14.9
3 60 PCT T     51    .830   13.63    846   14.515    18507       70    2138     358    .147    10.3      314    52.6    70    8.9
4 30 PCT T     50    .120   11.76    851   11.934    11703       53     238     277    .077     4.1       18    21.3    35   14.9
5 10 PCT T     46    .130   13.85    383   14.030     8301       29     155      75    .057     1.7        9     4.3    12   17.8
6 30 PCT T     48    .160   11.89    855   12.102    11703       50     313     275    .077     3.9       24    21.1    35   14.9
7 90 PCT T     50    .940   13.51   1297   14.554    25175       93    3459     745    .113    10.6      391    84.2   106    2.8
8 30 PCT T     47    .130   11.76    874   11.941    11703       50     257     284    .077     3.8       20    21.9    35   14.9
9 C.T.       1458    .390    9.25    110   11.215     2631      369     185       9    .143    52.8       26     1.2     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.7       26     6.7
1 IDLE        538    .600    9.66     57   10.841     2359      126     264       4    .232    29.3       61     1.0     0   17.3
2 30 PCT T     80    .150   11.69    767   11.926    11703       85     287     250    .077     6.5       23    19.2    35   14.9
3 60 PCT T     55    .770   13.63    858   14.459    18507       76    1991     365    .147    11.2      293    53.6    70    8.9
4 30 PCT T     52    .130   11.80    857   11.946    11703       55     256     278    .077     4.2       20    21.4    35   14.9
5 10 PCT T     47    .140   13.93    426   14.121     8301       30     166      83    .057     1.7        9     4.7    12   17.8
6 30 PCT T     50    .170   11.87    887   12.094    11703       52     332     286    .077     4.0       26    21.9    35   14.9
7 90 PCT T     45    .910   13.52   1362   14.479    25175       85    3196     786    .113     9.5      361    88.8   106    2.8
8 30 PCT T     42    .120   11.72    943   11.885    11703       45     239     308    .077     3.4       18    23.7    35   14.9
9 C.T.       1497    .430    9.32    114   11.367     2631      374     201       9    .143    53.5       29     1.3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.7       25     7.0
1 IDLE        538    .600    9.66     57   10.841     2359      126     264       4    .232    29.3       61     1.0     0   17.3
2 30 PCT T     73    .140   11.69    784   11.909    11703       77     278     256    .077     6.0       21    19.7    35   14.9
3 60 PCT T     64    .860   13.02    872   13.938    18507       77    2307     384    .147    11.4      339    56.5    70    8.9
4 30 PCT T     50    .120   11.71    915   11.884    11703       53     239     299    .077     4.1       18    23.0    35   14.9
5 10 PCT T     44    .150   13.91    407   14.108     8301       28     178      80    .057     1.6       10     4.5    12   17.8
6 30 PCT T     46    .130   11.77    895   11.950    11703       49     257     291    .077     3.7       20    22.4    35   14.9
7 90 PCT T     46    .850   13.51   1462   14.410    25175       87    3000     848    .113     9.8      339    95.8   106    2.8
8 30 PCT T     44    .120   11.75    923   11.918    11703       47     238     301    .077     3.6       18    23.2    35   14.9
9 C.T.       1461    .390    9.20    101   11.168     2631      372     186       8    .143    53.2       27     1.1     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.6       25     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     3.9       28     6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     3.6       25     7.2
FOUR CYCLE COMPOSITE -                     HC- NDIR 0.35(     3.9) + 0.65(     3.6) =    3.731   GM/BHP HR
                                           CO- NDIR 0.35(    27.9) + 0.65(    25.1) =   26.078   GM/BHP HR
                                           NO2-NDIR 0.35(     6.9) + 0.65(     7.2) =    7.064   GM/BHP HR
                                                                  CORRECTED NO2 =    7.546   GM/BHP HR
                                                                           BSFC =     .691   LB/BHP HR


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             CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR              MAN.
MODE        HC-FID     CO     CO2  NO-CL   CARBON    CONS.       HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL    HP   VAC.
------------------------------------------------------------------------------------------------------
1 IDLE       3439    .590    9.34     30   10.274     2359       79     274       2    .232    18.3       63      .5     0   17.3
2 30 PCT T    277    .180   11.67    700   11.878    11703       27     358     229    .077     2.1       28    17.6    35   14.9
3 60 PCT T    188    .980   13.28    875   14.279    18507       24    2566     377    .147     3.6      377    55.3    70    8.9
4 30 PCT T    163    .130   11.69    825   11.836    11703       16     260     271    .077     1.2       20    20.9    35   14.9
5 10 PCT T     85    .180   13.87    350   14.058     8301        5     215      69    .057      .3       12     3.9    12   17.8
6 30 PCT T    142    .150   11.79    825   11.954    11703       14     297     268    .077     1.1       23    20.6    35   14.9
7 90 PCT T    163   1.060   13.36   1263   14.436    25175       28    3734     731    .113     3.2      422    82.6   106    2.8
8 30 PCT T    108    .130   11.70    875   11.841    11703       11     260     287    .077      .8       20    22.1    35   14.9
9 C.T.      28275    .470    8.99     23   12.288     2631      605     203       2    .143    86.6       29      .2     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.5       29     6.6
1 IDLE       3439    .590    9.34     30   10.274     2359       79     274       2    .232    18.3       63      .5     0   17.3
2 30 PCT T    243    .160   11.72    730   11.904    11703       24     318     238    .077     1.8       24    18.3    35   14.9
3 60 PCT T    124    .830   13.63    750   14.472    18507       16    2144     318    .147     2.3      315    46.8    70    8.9
4 30 PCT T    139    .120   11.76    800   11.894    11703       14     239     261    .077     1.1       18    20.1    35   14.9
5 10 PCT T     88    .130   13.85    325   13.989     8301        5     156      64    .057      .3        9     3.6    12   17.8
6 30 PCT T    121    .160   11.89    825   12.062    11703       12     314     266    .077      .9       24    20.5    35   14.9
7 90 PCT T    124    .990   13.51   1238   14.512    25175       21    3469     713    .113     2.4      392    80.6   106    2.8
8 30 PCT T     93    .130   11.76    800   11.899    11703        9     258     261    .077      .7       20    20.1    35   14.9
9 C.T.      23090    .390    9.25     26   11.999     2631      508     173       2    .143    72.7       25      .3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     3.0       26     6.3
1 IDLE       2874    .600    9.66     30   10.547     2359       64     271       2    .232    14.9       63      .5     0   17.3
2 30 PCT T    246    .150   11.69    730   11.865    11703       24     299     239    .077     1.9       23    18.4    35   14.9
3 60 PCT T    120    .770   13.63    788   14.412    18507       15    1997     336    .147     2.3      294    49.4    70    8.9
4 30 PCT T    135    .130   11.80    850   11.944    11703       13     257     277    .077     1.0       20    21.3    35   14.9
5 10 PCT T     88    .140   13.93    350   14.078     8301        5     167      69    .057      .3       10     3.9    12   17.8
6 30 PCT T    121    .170   11.87    875   12.052    11703       12     333     282    .077      .9       26    21.7    35   14.9
7 90 PCT T    117    .910   13.52   1275   14.442    25175       20    3204     738    .113     2.3      362    83.4   106    2.8
8 30 PCT T     65    .120   11.72    913   11.847    11703        6     239     299    .077      .5       18    23.1    35   14.9
9 C.T.      24420    .430    9.32     30   12.192     2631      527     187       2    .143    75.4       27      .3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     2.9       25     6.6
1 IDLE       2874    .600    9.66     30   10.547     2359       64     271       2    .232    14.9       63      .5     0   17.3
2 30 PCT T    250    .140   11.69    750   11.855    11703       25     279     246    .077     1.9       21    18.9    35   14.9
3 60 PCT T    184    .860   13.02    804   13.898    18507       24    2313     355    .147     3.6      340    52.2    70    8.9
4 30 PCT T    145    .120   11.71    900   11.845    11703       14     240     295    .077     1.1       18    22.7    35   14.9
5 10 PCT T     92    .150   13.91    363   14.069     8301        5     179      71    .057      .3       10     4.1    12   17.8
6 30 PCT T    131    .130   11.77    875   11.913    11703       13     258     285    .077     1.0       20    22.0    35   14.9
7 90 PCT T    138    .850   13.51   1413   14.374    25175       24    3007     822    .113     2.7      340    92.8   106    2.8
8 30 PCT T    104    .120   11.75    912   11.889    11703       10     234     298    .077      .8       18    23.0    35   14.9
9 C.T.      21774    .390    9.20     28   11.767     2631      487     176       2    .143    69.6       25      .3     0   23.4
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     2.8       25     7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     3.2       28     6.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     2.9       25     6.8
FOUR CYCLE COMPOSITE -                     HC- FID  0.35(     3.2) + 0.65(     2.9) =    3.012   GM/BHP HR
                                           CO- NDIR 0.35(    27.9) + 0.65(    25.2) =   26.143   GM/BHP HR
                                           NO2-CL   0.35(     6.4) + 0.65(     6.8) =    6.673   GM/BHP HR
                                                                  CORRECTED NO2 =    7.129   GM/BHP HR
                                                                           BSFC =     .691   LB/BHP HR
                    TABLE G-51. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 7-B    TEST 96   RUN 3    1973 CALIF ENGINE       09-13-73      K =1.057      HUM = 95.9  GR/LB
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                CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR            MAN.
MODE            HC      CO     CO2      NO   CARBON    CONS.      HC      CO     NO2    FACT.    HC          CO     NO2     HP    VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE          493    .640    9.44     65   10.612    2359      118     287      5    .232    27.5         67     1.1     0    17.3
2 30 PCT T       68    .230   12.00    778   12.303   11703       70     442    246    .077     5.4         34    18.9    35    19.4
3 60 PCT T       41    .900   13.37   1401   13.814   18507       59    1082    623    .197     8.7        159    91.6    70     8.9
4 30 PCT T       37    .160   11.74    854   11.990   11703       39     315    277    .077     3.0         24    21.3    35    19.4
5 10 PCT T       30    .210   12.45    349   12.692    8301       21     277     76    .057     1.2         16     4.3    12    17.8
6 30 PCT T       33    .190   11.85    841   12.076   11703       35     372    271    .077     2.7         29    20.8    35    19.4
7 90 PCT T       32   1.080   13.53   1302   14.645   25175       59    3750    743    .113     6.7        424    84.0   106     2.8
8 30 PCT T       29    .160   11.87    878   12.061   11703       30     314    283    .077     2.3         24    21.8    35    19.4
9 C.T.         1609    .600    9.91    122   12.198    2631      376     262      9    .193    53.8         38     1.3     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.3         24     7.9
1 IDLE          493    .640    9.44     65   10.612    2359      118     287      5    .232    27.5         67     1.1     0    17.3
2 30 PCT T       50    .180   11.84    779   12.074   11703       52     352    251    .077     4.0         27    19.2    35    19.4
3 60 PCT T       36    .930   13.25   1330   13.719   18507       52    1172    596    .197     7.7        172    87.6    70     8.9
4 30 PCT T       32    .150   11.91    851   11.995   11703       34     296    276    .077     2.6         23    21.2    35    19.4
5 10 PCT T       27    .220   14.01    396   14.259    8301       17     259     77    .057     1.0         15     4.4    12    17.8
6 30 PCT T       29    .210   11.94    852   12.181   11703       30     408    272    .077     2.3         31    20.9    35    19.4
7 90 PCT T       27    .990   13.61   1310   14.629   25175       50    3441    748    .113     5.7        389    84.6   106     2.8
8 30 PCT T       26    .150   11.82    899   11.998   11703       27     296    291    .077     2.1         23    22.4    35    19.4
9 C.T.         1703    .520    9.38    119   11.739    2631      412     235      9    .193    58.9         34     1.3     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.3         23     7.6
1 IDLE          464    .640    9.92     74   11.061    2359      107     276      5    .232    24.8         64     1.2     0    17.3
2 30 PCT T       51    .160   11.72    762   11.935   11703       54     317    248    .077     4.2         24    19.1    35    19.4
3 60 PCT T       38    .360   13.09   1494   13.491   18507       56     998    680    .197     8.3        197   100.0    70     8.9
4 30 PCT T       33    .150   11.80    873   11.986   11703       35     296    283    .077     2.7         23    21.8    35    19.4
5 10 PCT T       27    .180   13.99    419   14.199    8301       17     213     81    .057     1.0         12     4.6    12    17.8
6 30 PCT T       30    .170   11.82    823   12.022   11703       32     334    282    .077     2.4         26    21.7    35    19.4
7 90 PCT T       30    .940   13.62   1368   14.592   25175       56    3276    772    .113     6.3        370    87.2   106     2.8
8 30 PCT T       28    .130   11.76    887   11.920   11703       30     258    292    .077     2.3         20    22.5    35    19.4
9 C.T.         1661    .500    9.25    117   11.599    2631      409     230      9    .193    58.5         33     1.3     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.3         21     8.3
1 IDLE          464    .640    9.92     74   11.061    2359      107     276      5    .232    24.6         64     1.2     0    17.3
2 30 PCT T       65    .160   11.67    783   11.900   11703       69     318    259    .077     5.3         24    19.9    35    19.4
3 60 PCT T       43    .910   13.25   1380   13.706   18507       63    1118    619    .197     9.2        169    90.9    70     8.9
4 30 PCT T       39    .140   11.76    891   11.992   11703       41     277    290    .077     3.2         21    22.3    35    19.4
5 10 PCT T       33    .240   14.04    441   14.316    8301       21     281     95    .057     1.2         16     5.4    12    17.8
6 30 PCT T       34    .190   11.84    873   12.067   11703       36     372    281    .077     2.7         29    21.6    35    19.4
7 90 PCT T       34    .920   13.58   1429   14.537   25175       64    3218    822    .113     7.2        364    92.9   106     2.8
8 30 PCT T       31    .140   11.79    917   11.963   11703       33     277    298    .077     2.5         21    22.9    35    19.4
9 C.T.         1664    .520    9.37    113   11.687    2631      405     236      8    .193    57.9         34     1.2     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.4         22     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     3.3         24     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     3.3         22     8.3
FOUR CYCLE COMPOSITE -                   HC= NDIR 0.35(     3.3) + 0.65(     3.3) =     3.319    GM/BHP HR
                                         CO= NDIR 0.35(    23.6) + 0.65(    21.6) =    22.302    GM/BHP HR
                                         NO2=NDIR 0.35(     7.8) + 0.65(     8.3) =     8.119    GM/BHP HR
                                                              CORRECTED NO2 =     8.577    GM/BHP HR
                                                                       BSFC =      .691    LB/BHP HR
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                CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR        WT.        WEIGHTED GM/HR            MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID        CO  NO2-CL     HP    VAC.
-------------------------------------------------------------------------------------------------------------------------------
1 IDLE         2771    .640    9.44     25   10.357    2359       63     294      2    .232    14.6         68      .4     0    17.3
2 30 PCT T      272    .230   12.00    900   12.257   11703       26     444    285    .077     2.0         34    22.0    35    19.4
3 60 PCT T      166    .900   13.37   1308   13.287   18507       22    1085    583    .197     3.3        159    85.7    70     8.9
4 30 PCT T      159    .160   11.79    800   11.966   11703       16     316    260    .077     1.2         24    20.0    35    19.4
5 10 PCT T       84    .210   12.48    338   12.668    8301        5     278     74    .057      .3         16     4.2    12    17.8
6 30 PCT T      153    .190   11.85    813   12.055   11703       15     373    262    .077     1.1         29    20.2    35    19.4
7 90 PCT T      152   1.080   13.53   1200   14.625   25175       26    3755    686    .113     3.0        424    77.5   106     2.8
8 30 PCT T      119    .160   11.87    875   12.041   11703       11     319    282    .077      .9         24    21.7    35    19.4
9 C.T.        24381    .600    9.91     20   13.348    2631      579     239      1    .193    82.8         34      .2     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.2         24     7.5
1 IDLE         2771    .640    9.44     25   10.357    2359       63     294      2    .232    14.6         68      .4     0    17.3
2 30 PCT T      257    .180   11.84    775   12.096   11703       25     353    250    .077     1.9         27    19.2    35    19.4
3 60 PCT T      187    .930   13.25   1225   13.699   18507       25    1173    549    .197     3.7        174    80.8    70     8.9
4 30 PCT T      144    .150   11.81    813   11.975   11703       15     296    264    .077     1.1         23    20.3    35    19.4
5 10 PCT T       95    .220   14.01    350   14.240    8301        6     259     68    .057      .3         15     3.9    12    17.8
6 30 PCT T      135    .210   11.94    850   12.163   11703       13     408    272    .077     1.0         31    20.9    35    19.4
7 90 PCT T      135    .990   13.61   1213   14.619   25175       23    3495    694    .113     2.6        389    78.9   106     2.8
8 30 PCT T      111    .150   11.82    875   11.981   11703       11     296    284    .077      .8         23    21.8    35    19.4
9 C.T.        26639    .520    9.38     20   12.563    2631      558     220      1    .193    79.8         31      .2     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.1         23     7.3
1 IDLE         2854    .640    9.92     30   10.845    2359       62     281      2    .232    14.4         65      .5     0    17.3
2 30 PCT T      253    .160   11.72    750   11.905   11703       25     318    245    .077     1.9         24    18.8    35    19.4
3 60 PCT T      204    .360   13.09   1400   13.470   18507       28     999    639    .197     4.1        197    93.9    70     8.9
4 30 PCT T      157    .150   11.80    825   11.966   11703       15     296    268    .077     1.2         23    20.6    35    19.4
5 10 PCT T      106    .180   13.99    350   14.181    8301        6     213     68    .057      .4         12     3.9    12    17.8
6 30 PCT T      142    .170   11.82    800   12.004   11703       14     335    259    .077     1.1         26    19.9    35    19.4
7 90 PCT T      132    .940   13.62   1300   14.573   25175       23    3280    746    .113     2.6        371    84.3   106     2.8
8 30 PCT T      111    .130   11.76    862   11.901   11703       11     258    281    .077      .8         20    21.7    35    19.4
9 C.T.        25728    .500    9.25     25   12.323    2631      549     216      2    .193    78.6         31      .3     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.1         21     7.8
1 IDLE         2854    .640    9.92     30   10.845    2359       62     281      2    .232    14.4         65      .5     0    17.3
2 30 PCT T      256    .160   11.67    750   11.856   11703       25     319    246    .077     1.9         25    18.9    35    19.4
3 60 PCT T      189    .910   13.25   1300   13.679   18507       26    1121    584    .197     3.8        165    85.8    70     8.9
4 30 PCT T      155    .140   11.76    850   11.916   11703       15     278    277    .077     1.2         21    21.3    35    19.4
5 10 PCT T      110    .240   14.04    362   14.291    8301        6     282     70    .057      .4         16     4.0    12    17.8
6 30 PCT T      139    .190   11.84    850   12.044   11703       13     373    274    .077     1.0         29    21.1    35    19.4
7 90 PCT T      142    .920   13.58   1362   14.514   25175       25    3223    784    .113     2.8        364    88.6   106     2.8
8 30 PCT T      114    .140   11.79    862   11.941   11703       11     277    280    .077      .9         21    21.6    35    19.4
9 C.T.        24444    .520    9.37     28   12.335    2631      521     224      2    .193    74.6         32      .4     0    23.4
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     3.0         22     7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     3.2         24     7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     3.1         22     7.6
FOUR CYCLE COMPOSITE -                   HC- FID  0.35(     3.2) + 0.65(     3.1) =     3.100    GM/BHP HR
                                         CO- NDIR 0.35(    23.6) + 0.65(    21.6) =    22.307    GM/BHP HR
                                         NO2-CL   0.35(     7.4) + 0.65(     7.8) =     7.651    GM/BHP HR
                                                              CORRECTED NO2 =     8.088    GM/BHP HR
                                                                       BSFC =      .691    LB/BHP HR
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                              TABLE G-52. MASS EMISSIONS BY NINE-MODE F.I.
ENGINE 7-UP  TEST 127  RUN 1  N-CAT EGR=10          10-24-73      B 31.013      H = 29.3  GR/LB
-----------------------------------------------------------------------------------------------------------------
                 CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
MODE             HC      CO     CO2     NO    CARBON   CONS.       HC      CO     NO2    FACT.    HC      CO    NO2     HP        VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          103    .020    9.02    110     9.151    2087       26       9       8    .232    5.9      2    1.8      0      17.0
2 30 PCT T       42    .030   11.66    225    11.735   13835       53      71      89    .077    4.1      6    6.8     35      11.5
3 60 PCT T       33    .050   14.18    512    14.265   19142       33     163     228    .147    4.9     24   33.6     20       7.5
4 30 PCT T       23    .010   11.79    318    11.825   13835       24      24     124    .077    2.2      2    9.6     35      10.5
5 10 PCT T       23    .010   10.92    212    10.955    9072       21      17      59    .057    1.2      1    3.3     11      16.2
6 30 PCT T       23    .010   11.79    304    11.825   13835       24      24     118    .077    2.2      2    9.1     46      11.6
7 90 PCT T       24    .190   14.49   1185    14.705   24721       42     645     661    .113    4.7     73   74.7    105       2.9
8 30 PCT T       18    .010   12.05    341    12.079   13835       22      23     126    .077    1.7      2    9.7     35      11.6
9 C.T.           65    .030    9.33     60     9.430    2177       16      19       5    .143    2.3      3     .7      0      24.9
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .9      3    4.8
1 IDLE          103    .020    9.02    110     9.151    2087       26       9       8    .232    5.9      2    1.9      0      17.0
2 30 PCT T       29    .010   11.92    277    11.960   13835       35      23     106    .077    2.7      2    8.2     46      11.6
3 60 PCT T       18    .060   14.49    526    14.568   19142       26     159     229    .147    3.8     23   33.7     20       7.5
4 30 PCT T       18    .010   11.92    304    11.948   13835       23      23     117    .077    1.7      2    9.0     35      11.6
5 10 PCT T       18    .030   10.80    263    10.848    9072       16      51      73    .057     .9      3    4.2     11      16.2
6 30 PCT T       18    .010   11.92    330    11.948   13835       23      23     127    .077    1.7      2    9.8     45      11.6
7 90 PCT T       18    .160   14.49   1239    14.668   24721       33     545     693    .113    3.7     62   78.4    106       2.3
8 30 PCT T       18    .010   12.05    344    12.079   13835       22      23     131    .077    1.7      2   10.1     35      11.6
9 C.T.           65    .060    9.44     48     9.570    2177       16      28       4    .143    2.3      4     .6      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .7      3    4.6
1 IDLE           89    .040    9.44     60     9.576    2087       21      18       4    .232    4.9      4    1.0      0      17.0
2 30 PCT T       42    .010   11.79    290    11.835   13835       40      24     113    .077    3.1      2    8.7     35      11.5
3 60 PCT T       18    .020   14.49    483    14.579   19142       26     186     211    .147    3.8     27   31.0     20       7.5
4 30 PCT T       18    .010   12.05    344    12.079   13835       22      23     131    .077    1.7      2   10.1     35      11.5
5 10 PCT T       18    .010   10.68    277    10.709    9072       16      17      78    .057     .9      1    4.4     11      15.2
6 30 PCT T       18    .010   11.92    344    11.948   13835       23      23     132    .077    1.7      2   10.2     46      11.6
7 90 PCT T       18    .130   14.49   1313    14.638   24721       33     443     736    .113    3.7     50   83.2    106       2.3
8 30 PCT T       18    .010   12.31    357    12.339   13825       22      23     133    .077    1.7      2   10.2     35      11.6
9 C.T.           47    .050    9.77     48     9.881    2177       11      27       4    .143    1.6      4     .5      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .7      3    4.7
1 IDLE           89    .040    9.44     60     9.576    2087       21      18       4    .232    4.9      4    1.0      0      17.0
2 30 PCT T       32    .010   11.79    303    11.835   13835       40      24     118    .077    3.1      2    9.1     35      11.5
3 60 PCT T       22    .090   14.49    413    14.604   19142       31     240     180    .147    4.6     35   26.4     20       7.5
4 30 PCT T       22    .090   11.92    331    12.034   13835       27     208     126    .077    2.1     16    9.7     35      10.5
5 10 PCT T       22    .010   10.68    290    10.714    9072       20      17      82    .057    1.1      1    4.7     11      16.2
6 30 PCT T       22    .010   11.92    344    11.954   13835       27      23     132    .077    2.1      2   10.2     35      11.6
7 90 PCT T       22    .140   14.49   1350    14.654   24721       40     477     755    .113    4.5     54   85.4    105       2.8
8 30 PCT T       22    .010   11.92    344    11.954   13825       27      23     132    .077    2.1      2   10.2     35      10.6
9 C.T.           60    .060    9.33     48     9.455    2177       15      28       4    .143    2.1      4     .5      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .8      4    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------       .8      3    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------       .7      3    4.7
FOUR CYCLE COMPOSITE -                       HC- NDIR 0.35(     .8) + 0.65(     .7) =     .759   GM/BHP HR
                                             CO- NDIR 0.35(    3.2) + 0.65(    3.2) =    3.162   GM/BHP HR
                                             NO2-NDIR 0.35(    4.5) + 0.65(    4.7) =    4.632   GM/BHP HR
                                                               CORRECTED NO2 =    4.692   GM/BHP HR
                                                                        BSFC =     .731   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR                MAN.
MODE           HC-FID    CO     CO2   NO-CL   CARBON   CONS.       HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL    HP        VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          420    .020    9.02     80     9.082    2087       10       9       6    .232    2.2      2    1.4      0      17.0
2 30 PCT T      305    .040   11.66    190    11.720   13835       36      72      71    .077    2.8      6    5.4     35      10.5
3 60 PCT T       88    .050   14.18    460    14.249   19142       12     169     205    .147    1.7     24   30.2     20       7.5
4 30 PCT T      120    .010   11.79    280    11.812   13835       14      24     109    .077    1.1      2    8.4     35      11.5
5 10 PCT T       62    .010   10.92    190    10.936    9072        5      17      52    .057     .3      1    3.0     11      16.2
6 30 PCT T       93    .010   11.79    270    11.809   13835       11      24     105    .077     .8      2    8.1     35      11.5
7 90 PCT T       60    .190   14.49   1250    14.686   24721       10     646     699    .113    1.1     73   79.0    105       2.8
8 30 PCT T       53    .010   12.05    290    12.065   13825        6      23     110    .077     .5      2    8.5     35      10.5
9 C.T.          611    .030    9.33     35     9.421    2177       14      19       3    .143    2.0      3     .4      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .4      3    4.4
1 IDLE          420    .020    9.02     80     9.082    2087       10       9       6    .232    2.2      2    1.4      0      17.0
2 30 PCT T      305    .010   11.92    240    11.961   13835       35      23      92    .077    2.7      2    7.1     36      11.6
3 60 PCT T       88    .060   14.49    465    14.559   19142       12     159     203    .147    1.7     23   29.8     20       7.5
4 30 PCT T       83    .010   11.92    275    11.938   13835       10      23     106    .077     .7      2    8.1     36      11.6
5 10 PCT T       68    .030   10.80    235    10.847    9072        6      51      65    .057     .3      3    3.7     11      16.2
6 30 PCT T       87    .010   11.92    305    11.939   13835       10      23     117    .077     .8      2    9.0     45      11.6
7 90 PCT T       73    .140   14.49   1163    14.657   24721       12     545     651    .113    1.4     62   73.6    105       2.3
8 30 PCT T       41    .010   12.05    313    12.064   13825        5      23     119    .077     .4      2    9.2     36      11.5
9 C.T.          548    .040    9.44     30     9.560    2177       14      28       2    .143    1.9      4     .4      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .4      3    4.2
1 IDLE          414    .040    9.44     30     9.521    2087        9      18       2    .232    2.1      4     .6      0      17.0
2 30 PCT T      209    .010   11.79    250    11.821   13835       24      24      97    .077    1.9      2    7.5     46      11.5
3 60 PCT T       60    .070   14.49    420    14.566   19142        8     186     183    .147    1.2     27   26.9     20       7.5
4 30 PCT T       46    .010   12.05    300    12.067   13835        8      23     114    .077     .6      2    8.8     46      10.6
5 10 PCT T       44    .010   10.68    240    10.694    9072        4      17      68    .057     .2      1    3.9     11      16.2
6 30 PCT T       73    .010   11.92    310    11.937   13835        8      23     119    .077     .7      2    9.2     45      11.5
7 90 PCT T       79    .130   14.49   1250    14.628   24721       13     444     701    .113    1.5     50   79.3    136       2.3
8 30 PCT T       37    .010   12.31    338    12.324   13825        4      23     126    .077     .3      2    9.7     35      11.5
9 C.T.          478    .040    9.77     30     9.878    2177       11      27       2    .143    1.5      4     .2      0      24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .3      3    4.4
1 IDLE          414    .040    9.44     30     9.521    2047        9      18       2    .232    2.1      4     .6      0      17.0
2 30 PCT T      153    .010   11.79    260    11.815   13835       18      24     101    .077    1.4      2    7.8     46      11.5
3 60 PCT T       57    .040   14.49    420    14.586   19142        7     239     183    .147    1.1     35   26.9     20       7.5
4 30 PCT T       34    .040   11.92    300    12.013   13835        4     209     115    .077     .3     16    8.9     35      11.5
5 10 PCT T       62    .010   10.58    265    10.646    9072        6      17      75    .057     .3      1    4.3     11      16.2
6 30 PCT T       56    .010   11.92    310    11.937   13835        8      23     119    .077     .6      2    9.2     46      11.5
7 90 PCT T       85    .140   14.49   1225    14.639   24721       14     478     715    .113    1.6     54   80.8    136       2.3
8 30 PCT T       34    .010   11.92    325    11.933   13825        4      23     125    .077     .3      2    9.6     35      10.5
9 C.T.          585    .050    9.33     30     9.448    2177       13      28       2    .143    1.9      4     .3              24.4
----------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .3      4    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)--------------------------       .4      3    4.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)--------------------------       .3      3    4.4
FOUR CYCLE COMPOSITE -                       HC- FID  0.35(     .4) + 0.65(     .3) =     .317   GM/BHP HR
                                             CO- NDIR 0.35(    3.2) + 0.65(    3.2) =    3.166   GM/BHP HR
                                             NO2-CL   0.35(    4.2) + 0.65(    4.4) =    4.323   GM/BHP HR
                                                               CORRECTED NO2 =    4.379   GM/BHP HR
                                                                        BSFC =     .731   LB/BHP HR
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                      TABLE G-53. MASS EMISSIONS BY NINE--MODE EPA
ENGINE 7-UP  TEST 127 RUN 2   O-CAT EGR-10          11-24-73      K = .997      HUM = 74.2  GR/LB
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                 CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.     WEIGHTED GM/HR                MAN.
MODE             HC     CO    CO2     NO      CARBON   CONS.    HC      CO     NO2    FACT.    HC       CO    NO2    HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE           51    .050  11.04    73     11.145    2087     10      19      5    .232     2.4       4    1.1     0    17.0
2 30 PCT T       28    .020  11.92   277     11.970   13835     35      47    106    .077     2.7       4    8.2    35    10.5
3 60 PCT T       23    .110  14.57   427     14.705   19142     32     299    195    .147     4.8      43   27.1    70     7.5
4 30 PCT T       19    .020  12.11   332     12.151   13835     23      46    126    .077     1.8       4    9.7    35    10.5
5 10 PCT T       19    .020  11.04   277     11.081    9072     17      33     75    .057     1.0       2    4.3    11    16.2
6 30 PCT T       19    .020  12.05   332     12.091   13835     23      46    126    .077     1.8       4    9.7    35    10.5
7 90 PCT T       23    .190  14.49  1185     14.705   24721     42     645    661    .113     4.7      73   74.7   105     2.8
8 30 PCT T       19    .020  12.18   348     12.221   13835     23      46    135    .077     1.8       4   10.4    35    10.5
9 C.T.           25    .030  10.92    61     11.031    2177     16      12      4    .143     2.3       2     .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .7       4    4.3
1 IDLE           51    .050  11.04    73     11.145    2087     10      19      5    .232     2.4       4    1.1     0    17.0
2 30 PCT T       28    .030  11.98   290     12.040   13835     35      70    111    .077     2.7       5    8.5    35    10.5
3 60 PCT T       23    .100  14.57   413     14.695   19142     32     263    179    .147     4.8      39   26.3    70     7.5
4 30 PCT T       19    .020  12.05   357     12.091   13835     23      46    136    .077     1.8       4   10.4    35    10.5
5 10 PCT T       19    .020  10.90   303     10.941    9072     17      34     83    .057     1.0       2    4.8    11    16.2
6 30 PCT T       23    .020  12.05   357     12.095   13835     28      46    136    .077     2.2       4   10.4    35    10.5
7 90 PCT T       23    .150  14.40  1350     14.575   24721     42     514    760    .113     4.8      58   85.9   105     2.8
8 30 PCT T       19    .020  12.05   385     12.091   13835     23      46    146    .077     1.8       4   11.3    35    10.5
9 C.T.           20    .030  10.86    61     10.906    2177     15      12      4    .143     2.2       2     .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .7       4    4.7
1 IDLE           51    .040  11.09    73     11.175    2087     10      30      5    .232     2.4       7    1.1     0    17.0
2 30 PCT T       28    .030  12.00   304     12.060   13835     35      70    116    .077     2.7       5    8.9    35    10.5
3 60 PCT T       21    .090  14.33   447     14.443   19142     30     241    197    .147     4.4      35   28.9    70     7.5
4 30 PCT T       19    .020  12.05   357     12.091   13835     23      46    136    .077     1.8       4   10.4    35    10.5
5 10 PCT T       19    .020  10.92   300     10.961    9072     17      33     82    .057     1.0       2    4.7    11    16.2
6 30 PCT T       20    .020  11.92   357     11.962   13835     25      47    137    .077     1.9       4   10.6    35    10.5
7 90 PCT T       20    .130  14.49  1398     14.642   24721     36     443    778    .113     4.1      50   87.9   105     2.8
8 30 PCT T       19    .020  12.05   357     12.091   13835     23      46    136    .077     1.8       4   10.4    35    10.5
9 C.T.           61    .020  10.10    61     10.186    2177     14       9      4    .143     2.0       1     .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .7       3    4.4
1 IDLE           51    .080  11.04    73     11.175    2087     10      30      5    .232     2.4       7    1.1     0    17.0
2 30 PCT T       28    .030  11.78   304     11.850   13835     35      71    118    .077     2.7       6    9.1    35    10.5
3 60 PCT T       20    .080  14.40   469     14.512   19142     28     240    205    .147     4.2      35   30.2    70     7.5
4 30 PCT T       20    .020  12.05   357     12.092   13835     25      46    136    .077     1.9       4   10.4    35    10.5
5 10 PCT T       19    .020  10.86   304     10.901    9072     17      34     84    .057     1.0       2    4.8    11    16.2
6 30 PCT T       20    .020  11.92   359     11.962   13835     25      47    134    .077     1.9       4   10.3    35    10.5
7 90 PCT T       23    .130  14.33  1465     14.485   24721     42     448    830    .113     4.8      51   93.8   105     2.8
8 30 PCT T       20    .020  12.05   371     12.092   13835     25      46    141    .077     1.9       4   10.8    35    10.5
9 C.T.           65    .030  10.33    61     10.430    2177     15      13      4    .143     2.1       2     .6     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .7       3    5.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------    .7       4    4.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------    .7       3    5.0
FOUR CYCLE COMPOSITE -                    HC= NDIR 0.35(     .7) + 0.65(    .7) =     .676   GM/BHP HR
                                          CO= NDIR 0.35(    3.8) + 0.65(   3.3) =    3.505   GM/BHP HR
                                          NO2=NDIR 0.35(    4.5) + 0.65(   5.0) =    4.808   GM/BHP HR
                                                             CORRECTED NO2 =    4.795   GM/BHP HR
                                                                      BSFC =     .731   LB/BHP HR


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                 CONCENTRATION AS MEASURED    TOTAL    FUEL     CALCULATED GM/HR       WT.     WEIGHTED GM/HR                MAN.
MODE             HC-FID  CO   CO2    NO-CL    CARBON   CONS.    HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP     VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE          433    .050  11.04    45     11.133    2087      8      19      3    .232     1.9       4     .7     0    17.0
2 30 PCT T      135    .020  11.92   212     11.954   13835     16      47     81    .077     1.2       4    6.3    35    10.5
3 60 PCT T       60    .110  14.57   323     14.686   19142      8     290    161    .147     1.2      43   23.7    70     7.5
4 30 PCT T       73    .020  12.11   309     12.137   13835      8      46    117    .077      .6       4    9.0    35    10.5
5 10 PCT T       34    .020  11.04   263     11.063    9072      3      33     72    .057      .2       2    4.1    11    16.2
6 30 PCT T       59    .020  12.05   310     12.076   13835      7      46    118    .077      .5       4    9.1    35    10.5
7 90 PCT T       44    .190  14.44  1108     14.689   24721     16     646    619    .113     1.9      73   70.0   105     2.8
8 30 PCT T       43    .020  12.18   325     12.204   13835      5      46    122    .077      .4       4    9.4    35    10.5
9 C.T.          565    .030  10.92    40     11.006    2177     11      12      3    .143     1.6       2     .4     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .3       4    3.4
1 IDLE          433    .050  11.04    45     11.133    2087      8      19      3    .232     1.9       4     .6     0    17.0
2 30 PCT T      119    .030  11.98   250     12.022   13835     14      70     96    .077     1.1       5    7.4    35    10.5
3 60 PCT T       47    .100  14.57   357     14.675   19142      6     263    155    .147      .9      39   22.7    70     7.5
4 30 PCT T       52    .020  12.05   315     12.075   13835      6      46    120    .077      .5       4    9.2    35    10.5
5 10 PCT T       31    .020  10.90   278     10.923    9072      3      34     77    .057      .1       2    4.4    11    16.2
6 30 PCT T       52    .020  12.05   340     12.075   13835      6      46    129    .077      .5       4   10.0    35    10.5
7 90 PCT T       79    .150  14.40  1300     14.558   24721     13     515    733    .113     1.5      58   82.8   105     2.8
8 30 PCT T       36    .020  12.05   350     12.074   13835      4      46    133    .077      .3       4   10.3    35    10.5
9 C.T.          523    .030  10.80    35     10.882    2177     10      12      2    .143     1.5       2     .3     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .2       4    4.4
1 IDLE          419    .080  11.04    38     11.161    2087      8      30      2    .232     1.8       7     .5     0    17.0
2 30 PCT T      121    .030  12.00   280     12.042   13835     14      70    107    .077     1.1       5    8.2    35    10.5
3 60 PCT T       42    .090  14.33   395     14.424   19142      6     241    174    .147      .8      35   25.6    70     7.5
4 30 PCT T       47    .020  12.05   322     12.075   13835      5      46    122    .077      .4       4    9.4    35    10.5
5 10 PCT T       31    .020  10.92   270     10.943    9072      3      33     74    .057      .1       2    4.2    11    16.2
6 30 PCT T       52    .020  11.92   320     11.945   13835      6      47    123    .077      .5       4    9.5    35    10.5
7 90 PCT T       75    .130  14.49  1313     14.627   24721     13     444    737    .113     1.4      50   83.3   105     2.8
8 30 PCT T       41    .020  12.05   333     12.074   13835      5      46    127    .077      .4       4    9.8    35    10.5
9 C.T.          519    .020  10.10    35     10.172    2177     11       9      2    .143     1.6       1     .4     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .2       3    4.5
1 IDLE          414    .080  11.04    38     11.161    2087      8      30      2    .232     1.8       7     .5     0    17.0
2 30 PCT T      141    .030  11.79   270     11.838   13835     16      71    105    .077     1.3       5    8.1    35    10.5
3 60 PCT T       42    .080  14.40   390     14.494   19142      6     240    171    .147      .8      35   25.1    70     7.5
4 30 PCT T       41    .020  12.05   322     12.074   13835      5      46    122    .077      .4       4    9.4    35    10.5
5 10 PCT T       28    .020  10.86   270     10.883    9072      2      34     75    .057      .1       2    4.3    11    16.2
6 30 PCT T       43    .020  11.92   323     11.946   13835      6      47    124    .077      .4       4    9.6    35    10.5
7 90 PCT T       28    .130  14.33  1380     14.469   24721     13     440    783    .113     1.5      51   88.5   105     2.8
8 30 PCT T       31    .020  12.05   350     12.073   13835      4      46    133    .077      .3       4   10.3    35    10.5
9 C.T.          438    .030  10.33    34     10.404    2177      9      13      2    .143     1.3       2     .3     0    24.4
----------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------    .2       3    4.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------    .3       4    4.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------    .2       3    4.6
FOUR CYCLE COMPOSITE -                    HC= FID  0.35(     .3) + 0.65(    .2) =     .245   GM/BHP HR
                                          CO= NDIR 0.35(    3.4) + 0.65(   3.3) =    3.509   GM/BHP HR
                                          NO2=CL   0.35(    4.2) + 0.65(   4.6) =    4.413   GM/BHP HR
                                                             CORRECTED NO2 =    4.400   GM/BHP HR
                                                                      BSFC =     .731   LB/BHP HR
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                    TABLE G-54. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 7-P  TEST 127 RUN-4   0-CAT EGR-5          10-25-73      X 21,950     HUM = 93.0  GR/LB
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         CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR     WT.      WEIGHTED GM/HR                MAX.
MODE       HC     CO    CO2    NO    CARBON   CONS.     HC    CO    NO2   FACT.   HC      CO    NO2     HP       VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE     122  .030   8.42    23    8.582    2268     35    16      6   .232    8.1      4    1.5      0      16.8
2 30 PCT T  56  .010  11.29   309   11.350   13109     70    23    117   .077    5.4      2    9.0     35      11.0
3 60 PCT T  28  .020  13.73   629   13.830   20367     45   204    308   .147    6.5     31   45.2     70       7.6
4 30 PCT T  28  .010  11.53   385   11.570   13109     34    23    145   .077    2.6      2   11.2     35      11.0
5 10 PCT T  23  .010  10.44   317   10.475    8936     21    17     90   .057    1.2      1    5.1     11      17.0
6 30 PCT T  23  .010  11.53   399   11.565   13109     28    23    150   .077    2.2      2   11.6     35      11.0
7 90 PCT T  28  .120  14.03  1389   14.230   23914     51   575    722   .113    5.7     65   82.2    105       2.8
8 30 PCT T  23  .010  11.66   441   11.695   13109     28    23    164   .077    2.1      2   12.6     35      11.0
9 C.T.      20  .010  10.33    23   10.416    1935     14     4      4   .143    2.0      1     .5      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------        1.1      3    5.5
1 IDLE     122  .030   8.42    23    8.582    2268     35    16      6   .232    8.1      4    1.5      0      16.8
2 30 PCT T  35  .010  11.79   441   11.838   13109     42    22    162   .077    3.2      2   12.5     35      11.0
3 60 PCT T  29  .140  14.33   385   14.500   20367     42   347    180   .147    6.2     58   26.4     70       7.6
4 30 PCT T  23  .010  12.05   483   12.085   13109     27    22    174   .077    2.1      2   13.4     35      11.0
5 10 PCT T  13  .010  10.80   427   10.831    8936     17    17    117   .057    1.0      1    6.7     11      17.0
6 30 PCT T  19  .010  11.79   483   11.821   13109     23    22    178   .077    1.8      2   13.7     35      11.0
7 90 PCT T  19  .120  14.18  1240   14.371   23914     34   569    682   .113    3.8     64   77.1    105       2.8
8 30 PCT T  19  .010  11.92   498   11.951   13109     23    22    181   .077    1.7      2   14.0     35      11.0
9 C.T.      56  .010  10.33    60   10.400    1905     11     4      4   .143    1.6      1     .5      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .9      4    4.9
1 IDLE      37  .080  11.04    61   11.160    2268      8    33      4   .232    1.9      8    1.0      0      16.8
2 30 PCT T  19  .010  11.79   441   11.821   13109     23    22    162   .077    1.8      2   12.5     35      11.0
3 60 PCT T  14  .120  14.33   427   14.471   20367     29   341    200   .147    4.2     50   29.3     70       7.6
4 30 PCT T  19  .010  11.92   498   11.951   13109     23    22    181   .077    1.7      2   14.0     35      11.0
5 10 PCT T  16  .010  10.92   441   10.947    8936     14    16    120   .057     .8      1    6.8     11      17.0
6 30 PCT T  16  .010  11.79   512   11.817   13109     19    22    189   .077    1.5      2   14.5     35      11.0
7 90 PCT T  15  .120  14.03  1226   14.221   23914     34   575    709   .113    3.9     65   80.2    105       2.8
8 30 PCT T  16  .010  11.92   555   11.947   13109     19    22    203   .077    1.5      2   15.6     35      11.0
9 C.T.      47  .010  10.33    23   10.391    1935      8     4      4   .143    1.3      1     .6      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .6      4    5.2
1 IDLE      37  .080  11.04    61   11.160    2268      8    33      4   .232    1.9      8    1.0      0      16.8
2 30 PCT T  23  .010  11.79   399   11.825   13109     28    22    147   .077    2.1      2   11.3     35      11.0
3 60 PCT T  19  .100  14.18   441   14.301   20367     28   308    209   .147    4.3     45   30.7     70       7.6
4 30 PCT T  14  .010  11.92   483   11.951   13109     23    22    176   .077    1.7      2   13.5     35      11.0
5 10 PCT T  15  .010  10.80   427   10.826    8936     13    17    117   .057     .8      1    6.7     11      17.0
6 30 PCT T  15  .010  11.79   498   11.816   13109     18    22    183   .077    1.4      2   14.1     35      11.0
7 90 PCT T  14  .160  14.03  1351   14.211   23914     34   543    752   .113    3.9     61   84.9    105       2.8
8 30 PCT T  14  .010  11.92   498   11.945   13109     17    22    181   .077    1.3      2   14.0     35      11.0
9 C.T.      46  .010  10.33    48   10.390    1935      9     4      3   .143    1.3      1     .4      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .6      4    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------        1.0      4    5.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------         .6      4    5.2
FOUR CYCLE COMPOSITE -                  HC= NDIR 0.35(    1.0) + 0.65(     .6) =     .698   GM/BHP HR
                                        CO= NDIR 0.35(    3.6) + 0.65(    3.7) =    3.674   GM/BHP HR
                                        NO2=NDIR 0.35(    5.2) + 0.65(    5.2) =    5.198   GM/BHP HR
                                                            CORRECTED NO2 =    5.459   GM/BHP HR
                                                                     BSFC =     .721   LB/BHP HR


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         CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR     WT.      WEIGHTED GM/HR                MAX.
MODE      HC-FID   CO    CO2  NO-CL  CARBON   CONS.     HC    CO    NO2   FACT.  HC-FID   CO   NO2-CL   HP       VAC.
--------------------------------------------------------------------------------------------------------------------
1 IDLE     620  .030   8.42    30    8.512    2268     17    16      3   .232    3.8      4     .6      0      16.8
2 30 PCT T 290  .010  11.28   285   11.319   13109     34    23    110   .077    2.6      2    8.4     35      11.0
3 60 PCT T  91  .020  13.73   550   13.809   20367     13   209    269   .147    2.0     31   39.6     70       7.6
4 30 PCT T 111  .010  11.53   350   11.551   13109     13    23    132   .077    1.0      2   10.2     35      11.0
5 10 PCT T  65  .010  10.44   290   10.455    8936      5    17     82   .057     .3      1    4.7     11      17.0
6 30 PCT T  94  .010  11.53   365   11.550   13109     11    23    138   .077     .9      2   10.6     35      11.0
7 90 PCT T 122  .120  14.03  1288   14.212   23914     20   575    717   .113    2.3     65   81.0    105       2.8
8 30 PCT T  69  .010  11.66   400   11.677   13109      8    23    149   .077     .6      2   11.5     35      11.0
9 C.T.     548  .010  10.33    30   10.399    1935     11     4      2   .143    1.5      1     .3      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .9      3    4.9
1 IDLE     620  .030   8.42    30    8.512    2268     17    16      3   .232    3.8      4     .6      0      16.8
2 30 PCT T 160  .010  11.79   390   11.816   13109     18    22    144   .077    1.4      2   11.1     35      11.0
3 60 PCT T  63  .140  14.33   325   14.476   20367      9   394    152   .147    1.3     58   22.4     70       7.6
4 30 PCT T  59  .010  12.05   435   12.066   13109      6    22    157   .077     .5      2   12.1     35      11.0
5 10 PCT T  41  .010  10.80   390   10.814    8936      3    17    107   .057     .2      1    6.1     11      17.0
6 30 PCT T  61  .010  11.79   440   11.806   13109      7    22    162   .077     .5      2   12.5     35      11.0
7 90 PCT T  92  .120  14.18  1150   14.359   23914     15   575    633   .113    1.7     64   71.6    105       2.8
8 30 PCT T  43  .010  11.92   450   11.934   13109      5    22    164   .077     .4      2   12.6     35      11.0
9 C.T.     548  .010  10.33    30   10.395    1935     10     4      2   .143    1.4      1     .3      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .3      4    4.4
1 IDLE     359  .080  11.04    40   11.156    2268      7    33      3   .232    1.7      8     .6      0      16.8
2 30 PCT T 100  .010  11.79   400   11.810   13109     11    22    147   .077     .9      2   11.4     35      11.0
3 60 PCT T  41  .120  14.33   350   14.454   20367      6   342    164   .147     .8     50   24.1     70       7.6
4 30 PCT T  47  .010  11.92   450   11.935   13109      5    22    164   .077     .4      2   12.6     35      11.0
5 10 PCT T  33  .010  10.92   410   10.933    8936      3    17    111   .057     .2      1    6.3     11      17.0
6 30 PCT T  55  .010  11.79   460   11.806   13109      6    22    170   .077     .5      2   13.1     35      11.0
7 90 PCT T  78  .120  14.03  1150   14.208   23914     13   576    640   .113    1.5     65   72.3    105       2.8
8 30 PCT T  38  .010  11.92   500   11.934   13109      4    22    182   .077     .3      2   14.0     35      11.0
9 C.T.     493  .010  10.33    35   10.389    1935      4     4      2   .143    1.3      1     .4      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .2      4    4.6
1 IDLE     358  .080  11.04    40   11.156    2268      7    33      3   .232    1.7      8     .6      0      16.8
2 30 PCT T  69  .010  11.79   380   11.807   13109      8    22    140   .077     .6      2   10.8     35      11.0
3 60 PCT T  35  .100  14.19   380   14.284   20367      5   308    180   .147     .7     45   26.4     70       7.6
4 30 PCT T  46  .010  11.92   420   11.935   13109      5    22    171   .077     .4      2   13.2     35      11.0
5 10 PCT T  25  .010  10.80   415   10.813    8936      2    17    114   .057     .1      1    6.5     11      17.0
6 30 PCT T  50  .010  11.79   490   11.805   13109      6    22    177   .077     .4      2   13.6     35      11.0
7 90 PCT T  98  .140  14.03  1288   14.200   23914     17   543    717   .113    1.9     61   81.1    105       2.8
8 30 PCT T  28  .010  11.92   475   11.933   13109      4    22    173   .077     .3      2   13.3     35      11.0
9 C.T.     466  .010  10.33    35   10.382    1905      4     4      2   .143    1.2      1     .4      0      24.6
-----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------         .2      4    4.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------         .4      4    4.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------         .2      4    4.8
FOUR CYCLE COMPOSITE -                  HC= FID  0.35(     .4) + 0.65(     .2) =     .278   GM/BHP HR
                                        CO= NDIR 0.35(    3.6) + 0.65(    3.7) =    3.679   GM/BHP HR
                                        NO2-CL   0.35(    4.7) + 0.65(    4.8) =    4.729   GM/BHP HR
                                                            CORRECTED NO2 =    4.967   GM/BHP HR
                                                                     BSFC =     .721   LB/BHP HR
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                          TABLE G-55. MASS EMISSIONS [illegible]
ENGINE 7-0H   TEST 127 [illegible]   DECAL [illegible]                    [illegible]          [illegible] = 87.9  GM/LB
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                CONCENTRATION AS MEASURED   TOTAL                 CALCULATED GM/HR         WT.     WEIGHTED GM/HR
MODE            HC      CO     CO2     NO   CARBON                HC       CO      NO2     FACT.   HC      CO     NO2    HP      BSF.
----------------------------------------------------------------------------------------------------------------------------------
1 IDLE          51    .040   10.80     61   [illegible]  1950     10       14        4     .232    2.1      1      .0     0    17.0
2 30 PCT T      37    .010   11.53    138   11,591      14334     63       16       53     .077    4.0      3     4.0    46    11.5
3 60 PCT T      23    .020   14.26    290   14,356      19777     85      195      134     .147    6.0     20    13.6    31     8.5
4 30 PCT T      28    .012   11.66    160   11,700      14334     37       16       66     .077    2.8      3     4.0    15    11.6
5 10 PCT T      23    .010   10.56    277   10,590       9027     21       17       30     .057    1.3      1     4.6    11    11.5
6 30 PCT T      23    .010   11.66    160   11,666      14334     34       26       66     .077    2.3      3     4.0    45    11.6
7 90 PCT T      23    .100   14.73   1524   14,156      24948     44      466      493     .113    4.8     19    40.0   106     8.8
8 30 PCT T      33    .100   11.41    160   11,566      14334     44      351       66     .077    3.6     19     5.1    36    11.6
9 C.T.          64    .010    9.26     30    9,360       2041     15        4        3     .143    2.2      1      .3     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .7      1     1.3
1 IDLE          61    .040   10.80     61   10,896       1950     10       10        4     .232    2.3      1      .0     0    17.0
2 30 PCT T      29    .033   11.23    122   11,236      14334    134       51       51     .077    2.4      1     4.0    46    11.5
3 60 PCT T      28    .053   14.95    363   14,030      19777     44      142      163     .147    6.3     21    21.4    31     8.5
4 30 PCT T      37    .011   11.41    160   11,460      14334     60       26       61     .077    3.0      1     4.0    15    11.5
5 10 PCT T      28    .010   10.48    389   10,220       9027     26       17      112     .057    1.5      1     4.0    11    11.5
6 30 PCT T      43    .010   11.41    160   11,471      14334     63       26       66     .077    4.3      3     4.1    46    11.6
7 90 PCT T      28    .100   14.18   1905   14,310      24948     63      452      841     .113    6.0     41    47.1   105     8.8
8 30 PCT T      30    .010   11.53    160   11,622      14334     40       26       66     .077    4.1      2     5.1    36    11.6
9 C.T.          61    .010    9.02     48    9,096       2041     15        6        4     .143    2.1      1      .6     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     1.1      3      .6
1 IDLE          28    .072    9.99     36   10,185       1950     16       27        2     .232    3.8             .6     9    17.0
2 30 PCT T      66    .010   11.91    135   11,989      14334     76       37       64     .077    5.8      3     4.3    46    11.5
3 60 PCT T      28    .140   14.93    381   14,121      19777     42      170      149     .147    6.3     25    21.0    31     8.5
4 30 PCT T      33    .010   11.41    160   11,466      14334     46       15       66     .077    3.9      3     4.1    15    11.6
5 10 PCT T      25    .010   10.48    398   10,217       9027     23       17      112     .057    1.9      1     4.4    11    11.6
6 30 PCT T      33    .010   11.41    160   11,461      14334     46       26       66     .077    3.9      3     6.1    45    11.5
7 90 PCT T      28    .100   14.18   1529   14,310      24948     63      352      883     .113    6.0     40    43.9   105     8.8
8 30 PCT T      30    .010   11.50    160   11,636      14334     44       26       66     .077    3.9      3     6.0    36    11.6
9 C.T.          65    .010    9.55     36    9,630       2041     16        4        3     .143    2.1      1      .4     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     1.1      2     4.4
1 IDLE          23    .072    9.99     36   10,188       1950     16       27        2     .232    3.8      6      .6     0    17.0
2 30 PCT T      66    .030   11.41    140   11,490      14334     25       50       61     .077    5.8      4     4.7    46    11.5
3 60 PCT T      24    .060   14.18    317   14,220      19777     42      158      144     .147    6.3     35    21.4    20     8.5
4 30 PCT T      33    .010   11.53    160   11,576      14334     44       25       66     .077    3.4      3     5.1    15    11.5
5 10 PCT T      22    .010   10.68    395   10,728       9027     28       17      109     .057    1.6      1     5.1    11    11.5
6 30 PCT T      37    .010   11.41    160   11,460      14334     50       26       66     .077    3.8      3     6.1    35    11.6
7 90 PCT T      28    .110   14.18   1389   14,320      24948     63      349      803     .113    6.0     44    41.8   105     8.8
8 30 PCT T      28    .010   11.53    123   11,670      14334     37       16       71     .077    2.4      3     4.5    36    11.6
9 C.T.          65    .010    9.12     36    9,200       2041     16        4        3     .143    2.2      1      .3     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------     1.1      1     4.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------     1.0      1     4.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------     1.1      2     4.4
FOUR CYCLE COMPOSITE =
                                    HC= NDIR 0.35(     1.0) + 0.65(     1.1) =     1.034   GM/BHP HR
                                    CO= NDIR 0.35(     2.6) + 0.65(     2.5) =     2.509   GM/BHP HR
                                    NO2=NDIR 0.   (     4.3) + 0.65(     4.3) =     4.306   GM/BHP HR
                                                              CORRECTED NO2 =     4.460   GM/BHP HR
                                                                       BSFC =      .745   LB/BHP HR


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                CONCENTRATION AS MEASURED      TOTAL     FUEL     CALCULATED GM/HR         WT.     WEIGHTED GM/HR
MODE            HC-FID   CO     CO2   NO-CL    CARBON    CONS.    HC       CO      NO2     FACT.   HC-FID  CO   NO2-CL   HP      BSF.
----------------------------------------------------------------------------------------------------------------------------------
1 IDLE          372   .040   10.80     55   10,877       1950      7       14        3     .232    1.6      1      .8     1    17.0
2 30 PCT T      189   .010   11.53    120   11,558      14334     22       26       43     .077    1.7      2     3.4    36    11.5
3 60 PCT T       38   .020   14.26    265   14,323      19777      4      195      117     .147     .6     40    17.2    31     8.5
4 30 PCT T       69   .010   11.66    160   11,677      14334      8       25       67     .077     .6      3     4.4    15    11.6
5 10 PCT T       12   .010   10.56    206   10,571       9027      1       17       81     .057     .1      1     4.6    11    11.5
6 30 PCT T       54   .010   11.56    145   11,626      14334      7       26       59     .077     .6      2     4.6    46    11.5
7 90 PCT T       69   .110   14.03   1492   14,137      24948     12      466      871     .113    1.9     40    40.9   105     8.8
8 30 PCT T      226   .100   11.41    135   11,632      14334     28      261       72     .077    2.1     19     4.6    36    11.5
9 C.T.          446   .010    9.20     20    9,336       2041     10        4        1     .143    1.4      1      .2     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .3      1      .1
1 IDLE          372   .040   10.80     55   10,877       1950      7       14        3     .232    1.6      3      .8     0    17.0
2 30 PCT T      619   .020   11.29    115   11,311      14334     20       51       48     .077    6.0      4     4.7    46    11.6
3 60 PCT T       47   .050   13.98    320   14,005      19777      7      143      150     .147    1.0     21    23.1    31     8.5
4 30 PCT T      265   .010   11.41    135   11,667      14334     33       26       56     .077    2.6      3     4.4    15    11.6
5 10 PCT T       30   .010   10.68    395   10,693       9027      3       17      111     .057     .1      1     4.4    11    11.5
6 30 PCT T      290   .010   11.91    145   11,444      14334     30       26       60     .077    2.4      3     4.6    45    11.5
7 90 PCT T       88   .110   14.18   1937   14,289      24948     15      353      831     .113    1.7     40    44.1   105     8.8
8 30 PCT T       90   .010   11.53    150   11,599      14334     11       26       63     .077     .9      3     4.6    35    11.5
9 C.T.          460   .010    9.02     30    9,076       2041     10        5        2     .143    1.5      1      .3     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .5      2     4.2
1 IDLE          683   .070    9.99     30   10,128       1950     13       27        2     .232    3.1      6      .9     1    17.0
2 30 PCT T      401   .110   11.91    130   11,960      14334     50       26       64     .077    3.9      3     4.3    46    11.5
3 60 PCT T       15   .140   14.93    300   14,090      19777      5      170      190     .147     .7     48    21.4    31     8.5
4 30 PCT T      136   .010   11.41    145   11,434      14334     17       15       60     .077    1.4      3     4.6    15    11.6
5 10 PCT T       21   .010   10.68    415   10,692       9027      2       17      116     .057     .1      1     4.6    11    11.6
6 30 PCT T      127   .010   11.41    145   11,533      14334     16       26       60     .077    1.3      3     4.0    45    11.6
7 90 PCT T       20   .100   14.18   1938   14,297      24948     13      353      831     .113    1.4     43    41.2   105     8.8
8 30 PCT T      111   .010   11.59    165   11,611      14334     14       26       64     .077    1.1      3     4.1    36    11.6
9 C.T.          418   .010    9.55     30    9,602       2041      9        4        2     .143    1.3      1      .3     1    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .9      2     4.2
1 IDLE          683   .070    9.99     30   10,128       1950     13       27        2     .232    3.1      6      .9     1    17.0
2 30 PCT T      400   .030   11.41    130   11,920      14334     50       50       61     .077    3.4      4     4.2    46    11.5
3 60 PCT T       32   .050   14.18    285   14,263      19777      4      158      131     .147     .6     25    14.4    31     8.5
4 30 PCT T      124   .010   11.53    150   11,652      14334     15       25       63     .077    1.2      3     4.4    15    11.6
5 10 PCT T       91   .010   10.59    395   10,693       9027      3       17      105     .057     .1      1     4.0    11    11.5
6 30 PCT T      102   .010   11.41    145   11,430      14334     23       26       60     .077    1.8      2     4.6    45    11.5
7 90 PCT T       59   .110   14.18   1325   14,206      24948      9      340      764     .113    1.1     44    46.4   105     8.8
8 30 PCT T       73   .010   11.53    150   11,647      14334      9       26       63     .077     .7      3     4.4    36    11.6
9 C.T.          461   .010    9.12     30    9,176       2041     10        4        2     .143    1.6      1      .3     0    24.6
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------------      .9      1     3.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------------      .9      1     4.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------------      .9      2     4.0
FOUR CYCLE COMPOSITE =
                                    HC= FID  0.35(      .9) + 0.65(      .9) =      .918   GM/BHP HR
                                    CO= NDIR 0.35(     2.6) + 0.65(     2.5) =     2.513   GM/BHP HR
                                    NO2=CL   0.35(     4.2) + 0.65(     4.0) =     4.074   GM/BHP HR
                                                              CORRECTED NO2 =     4.221   GM/BHP HR
                                                                       BSFC =      .745   LB/BHP HR
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                         TABLE G-56. [illegible]
ENGINE 2=1   TEST 123 RUN 1   [illegible] CAT, [illegible]        R = .923     HUM = 56.1  GR/LB
----------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE           HC     CO     CO2     NO    CARBON   CONS.    HC      CO     NO2    FACT.    HC      CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE         32    .011   10.92    46   10.933    2087      8       6      2    .232     1.8      1     .5     0    17.5
2 30 PCT T     31    .050   13.00   135   13.086   12792     35      49     44    .077     2.7      8    3.4    34    19.9
3 50 PCT T     33    .121   13.63   173   13.786   18144     47     414     76    .147     6.9     47   11.1    67     9.9
4 30 PCT T     24    .071   13.19   115   13.235   12792     24     137     35    .077     1.8     11    2.7    34    19.9
5 10 PCT T     21    .130   11.24    61   11.445    8165     17      43     14    .057     1.0      2     .8    11    18.2
6 30 PCT T     25    .071   13.00   110   13.093   12792     26     138     36    .077     2.0     11    2.7    34    19.9
7 90 PCT T     32    .191   13.40   128   13.030   24177     69     661     70    .113     7.8     75    8.0   100     3.9
8 30 PCT T     24    .080   13.23    74   13.395   12792     24     154     23    .077     1.8     12    1.8    34    19.9
9 C.T.         44    .011    6.61    30    6.656    1996     11       6      4    .144     1.5      1     .5     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .8      5    1.0
1 IDLE         32    .111   10.10    35   10.970    2087      8       9      3    .232     1.8      1     .5     0    17.5
2 30 PCT T     24    .060   13.11   133   14.040   12792     30     118     40    .077     2.3      9    3.1    34    19.9
3 50 PCT T     33    .180   13.73   144   13.926   18144     46     421     64    .147     6.8     62    9.4    67     9.9
4 30 PCT T     23    .070   13.14    98   13.235   12792     24     137     31    .077     1.8     11    2.4    34    19.9
5 10 PCT T     19    .060   11.66    44   11.221    8165     14      56     11    .057      .8      3     .6    11    18.2
6 30 PCT T     25    .080   13.19    94   13.297   12792     26     156     31    .077     2.0     12    2.4    34    19.9
7 90 PCT T     35    .210   13.73   111   13.974   24177     65     734     63    .113     7.4     83    7.1   100     3.9
8 30 PCT T     23    .080   13.22    74   13.335   12792     24     155     23    .077     1.8     12    1.8    34    19.9
9 C.T.         28    .011    6.46    24    6.490    1996      9       6      2    .143     1.3      1     .4     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .8      6     .9
1 IDLE         23    .093   11.04    31   11.095    2087      6      11      2    .232     1.1      3     .4     0    17.5
2 30 PCT T     28    .050   13.00   111   13.080   12792     30      99     36    .077     2.3      8    2.8    34    19.9
3 50 PCT T     30    .190   13.73   135   13.902   18144     42     369     58    .147     6.2     54    8.6    67     9.9
4 30 PCT T     23    .070   13.19    85   13.235   12792     24     137     27    .077     1.8     11    2.1    34    19.9
5 10 PCT T     19    .030   11.70    43   11.751    8165     14      42     11    .057      .8      2     .6    11    18.2
6 30 PCT T     25    .070   13.00    95   13.092   12792     26     138     28    .077     2.0     11    2.1    34    19.9
7 90 PCT T     35    .190   13.74   110   13.968   24177     66     630     63    .113     7.4     71    7.2   100     3.9
8 30 PCT T     23    .080   13.24    78   13.395   12792     24     154     23    .077     1.8     12    1.8    34    19.9
9 C.T.         28    .010    6.45    24    6.491    1996     10       6      2    .143     1.4      1     .4     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .8      5     .8
1 IDLE         23    .033   11.04    31   11.095    2087      6      11      2    .232     1.1      3     .4     0    17.5
2 30 PCT T     25    .050   13.00   110   13.077   12792     26      99     36    .077     2.0      8    2.8    34    19.9
3 50 PCT T     28    .140   13.48   145   14.090   18144     39     468     58    .147     5.7     69    8.5    67     9.9
4 30 PCT T     20    .070   13.19    85   13.232   12792     21     137     27    .077     1.6     11    2.1    34    19.9
5 10 PCT T     20    .030   11.66    41   11.712    8165     15      42      8    .057      .9      2     .5    11    18.2
6 30 PCT T     23    .070   13.00    95   13.095   12792     24     138     28    .077     1.9     11    2.1    34    19.9
7 90 PCT T     33    .200   13.74   101   13.966   24177     62     699     58    .113     7.0     79    6.6   100     3.9
8 30 PCT T     20    .070   13.19    74   13.232   12792     21     137     23    .077     1.6     11    1.8    34    19.9
9 C.T.         27    .010    6.45    24    6.489    1996      9       6      2    .143     1.3      1     .4     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .7      6     .8
AVERAGE 9 M---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------       .8      6     .9
AVERAGE 9 M---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------       .7      6     .8
NINE CYCLE COMPOSITE =               HC= 9MIN 0.35(     .8) + 0.65(     .7) =     .771   GM/BHP HR
                                     CO= 9MIN 0.35(    5.6) + 0.65(    5.6) =    5.618   GM/BHP HR
                                     NO2=9MIN 0.35(     .9) + 0.65(     .8) =     .834   GM/BHP HR
                                                          CORRECTED NO2 =     .770   GM/BHP HR
                                                                   BSFC =     .721   LB/BHP HR


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               CONCENTRATION AS MEASURED   TOTAL    FUEL     CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE           HC-FID  CO    CO2   NO-CL   CARBON   CONS.    HC      CO     NO2    FACT.  HC-FID    CO  NO2-CL  HP    VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        319    .010   10.92     4   10.962    2087      6       4      1    .232     1.4      1     .1     0    17.5
2 30 PCT T    283    .050   13.00   101   13.038   12792     27      99     33    .077     2.1      8    2.5    34    19.9
3 50 PCT T    449    .120   13.63   123   13.783   18144     44     319     54    .147     6.5     47    7.9    67     9.9
4 30 PCT T    214    .070   13.19    74   13.231   12792     21     137     24    .077     1.6     11    1.8    34    19.9
5 10 PCT T    198    .030   11.24    24   11.035    8165     10      42      5    .057      .6      2     .3    11    18.2
6 30 PCT T    242    .070   13.01    71   13.093   12792     23     138     23    .077     1.7     11    1.8    34    19.9
7 90 PCT T    413    .190   13.80    84   13.081   24177     71     661     47    .113     8.0     75    5.4   100     3.9
8 30 PCT T    158    .140   13.29    66   13.384   12792     15     154     18    .077     1.2     12    1.4    34    19.9
9 C.T.        334    .010    6.61    33    6.654    1996     10       6      3    .143     1.5      1     .5     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .8      5     .7
1 IDLE        319    .010   10.92     4   10.962    2087      6       4      1    .232     1.4      1     .1     0    17.5
2 30 PCT T    231    .060   13.00    47   13.083   12792     23     119     28    .077     1.7      9    2.2    34    19.9
3 50 PCT T    286    .180   13.73   110   13.919   18144     37     421     48    .147     5.5     62    7.0    67     9.9
4 30 PCT T    158    .071   13.14    64   13.226   12792     15     137     21    .077     1.2     11    1.6    34    19.9
5 10 PCT T    111    .040   11.66    16   11.711    8165      8      56      4    .057      .4      3     .2    11    18.2
6 30 PCT T    196    .080   13.19    68   13.290   12792     19     156     22    .077     1.5     12    1.7    34    19.9
7 90 PCT T    332    .210   13.73    71   13.979   24177     68     734     41    .113     7.7     83    4.6   100     3.9
8 30 PCT T    144    .080   13.22    60   13.314   12792     14     155     16    .077     1.1     12    1.2    34    19.9
9 C.T.        274    .010    6.45    12    6.483    1996      8       6      1    .143     1.2      1     .2     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .7      6     .6
1 IDLE        125    .141   11.04     4   11.082    2087      2      11      0    .232      .5      3     .1     0    17.5
2 30 PCT T    133    .050   13.00    83   13.070   12792     10      99     26    .077     1.5      8    2.0    34    19.9
3 50 PCT T    200    .140   13.73    88   13.894   18144     31     369     42    .147     4.6     54    6.2    67     9.9
4 30 PCT T    144    .070   13.19    60   13.224   12792     14     137     19    .077     1.1     11    1.5    34    19.9
5 10 PCT T    111    .030   11.70    15   11.741    8165      8      42      4    .057      .4      2     .2    11    18.2
6 30 PCT T    179    .070   13.00    63   13.088   12792     17     138     20    .077     1.3     11    1.6    34    19.9
7 90 PCT T    370    .180   13.73    66   13.947   24177     64     630     38    .113     7.3     71    4.3   100     3.9
8 30 PCT T    134    .080   13.24    55   13.383   12792     13     154     17    .077     1.0     12    1.3    34    19.9
9 C.T.        262    .010    6.45     7    6.486    1996      8       6      1    .143     1.2      1     .1     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .6      5     .5
1 IDLE        125    .030   11.39     4   11.082    2087      2      11      0    .232      .5      3     .1     0    17.5
2 30 PCT T    136    .050   13.00    80   13.069   12792     18      99     26    .077     1.4      8    2.0    34    19.9
3 50 PCT T    223    .190   13.98    94   14.082   18144     29     468     42    .147     4.2     69    6.2    67     9.9
4 30 PCT T    122    .070   13.19    55   13.223   12792     12     137     19    .077      .9     11    1.4    34    19.9
5 10 PCT T     81    .040   11.66    15   11.698    8165      6      42      3    .057      .3      2     .2    11    18.2
6 30 PCT T    136    .070   13.00    65   13.083   12792     16     138     14    .077     1.2     11    1.4    34    19.9
7 90 PCT T    163    .200   13.73    61   13.962   24177     64     699     34    .113     7.2     79    3.9   100     3.9
8 30 PCT T    130    .070   13.19    54   13.223   12792     13     137     17    .077     1.0     11    1.3    34    19.9
9 C.T.        231    .010    6.45     2    6.487    1996      8       6      1    .143     1.2      1     .1     0    24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------       .6      6     .5
AVERAGE 9 M---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------       .7      6     .6
AVERAGE 9 M---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------       .6      6     .5
NINE CYCLE COMPOSITE =               HC-FID  0.35(     .7) + 0.65(     .6) =     .621   GM/BHP HR
                                     CO= 9MIN 0.35(    5.6) + 0.65(    5.6) =    5.620   GM/BHP HR
                                     NO2-CL  0.35(     .6) + 0.65(     .5) =     .559   GM/BHP HR
                                                          CORRECTED NO2 =     .516   GM/BHP HR
                                                                   BSFC =     .721   LB/BHP HR
```

TABLE G-57. MASS EMISSIONS BY NINE-MODE EPA

[illegible] TEST 143 RUN-2 W/I CAT, 20JETS-60PV 10-19-73 K = .938 HUM = 57.9 GR/LB

MODE	CONCENTRATION AS MEASURED HC	CO	CO2	NO	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC	CO	NO2	HP	MAN. VAC.
1 IDLE	33	.141	10.21	24	10.766	2087	7	12	5	.232	1.6	3	1.1	0	17.5
2 30 PCT T	42	.060	12.86	121	12.960	12792	34	120	57	.077	3.0	9	4.4	34	19.9
3 60 PCT T	42	.120	13.54	144	13.790	18199	53	320	87	.147	7.8	47	12.8	67	9.9
4 30 PCT T	29	.061	13.90	149	13.090	12792	30	118	48	.077	2.3	9	3.7	34	19.9
5 10 PCT T	23	.031	11.66	23	11.715	8165	17	42	17	.057	1.0	2	1.0	11	18.2
6 30 PCT T	24	.070	13.30	149	13.100	12792	30	138	48	.077	2.3	11	3.7	34	19.9
7 90 PCT T	32	.140	13.73	144	13.950	24177	69	630	85	.113	7.8	71	9.6	100	3.9
8 30 PCT T	23	.070	13.19	93	13.235	12792	24	137	31	.077	1.8	11	2.4	34	19.9
9 C.T.	34	.010	6.14	36	6.176	1996	12	7	4	.193	1.6	1	.6	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.9	5	1.2		
1 IDLE	33	.031	10.29	22	10.766	2087	7	12	5	.232	1.6	3	1.1	0	17.5
2 30 PCT T	24	.140	13.90	120	13.070	12792	30	79	39	.077	2.3	6	3.0	34	19.9
3 60 PCT T	47	.110	13.73	135	13.872	18199	42	291	59	.147	6.2	43	8.6	67	9.9
4 30 PCT T	23	.050	13.14	94	13.225	12792	24	117	31	.077	1.9	9	2.4	34	19.9
5 10 PCT T	19	.020	11.66	44	11.701	8165	14	28	11	.057	.8	2	.6	11	18.2
6 30 PCT T	24	.060	13.00	91	13.040	12792	30	118	32	.077	2.3	9	2.4	34	19.9
7 90 PCT T	42	.170	13.73	122	13.949	24177	69	596	70	.113	7.8	67	7.9	100	3.9
8 30 PCT T	23	.070	13.19	85	13.235	12792	24	137	27	.077	1.8	11	2.1	34	19.9
9 C.T.	38	.010	6.21	36	6.250	1996	10	6	4	.193	1.9	1	.5	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.8	5	.9		
1 IDLE	23	.020	11.19	36	11.086	2087	5	8	2	.232	1.1	2	.5	0	17.5
2 30 PCT T	28	.090	13.19	110	13.210	12792	29	78	35	.077	2.3	6	2.7	34	19.9
3 60 PCT T	24	.110	13.59	135	13.720	18199	40	294	59	.147	5.9	43	8.7	67	9.9
4 30 PCT T	23	.050	13.19	98	13.225	12792	24	117	31	.077	1.9	9	2.4	34	19.9
5 10 PCT T	19	.020	11.66	98	11.701	8165	19	28	11	.057	.8	2	.6	11	18.2
6 30 PCT T	24	.060	13.19	98	13.230	12792	29	117	31	.077	2.3	9	2.4	34	19.9
7 90 PCT T	34	.160	13.74	123	13.926	24177	62	561	71	.113	7.0	63	8.0	100	3.9
8 30 PCT T	23	.070	13.19	85	13.235	12792	24	137	27	.077	1.8	11	2.1	34	19.9
9 C.T.	24	.010	6.01	36	6.050	1996	10	7	4	.193	1.9	1	.6	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.8	5	.9		
1 IDLE	24	.020	11.09	36	11.085	2087	6	8	2	.232	1.1	2	.5	0	17.5
2 30 PCT T	22	.040	13.19	117	13.209	12792	28	78	35	.077	2.2	6	2.7	34	19.9
3 60 PCT T	29	.100	13.74	135	13.860	18199	40	269	59	.147	5.8	39	8.6	67	9.9
4 30 PCT T	23	.050	13.14	90	13.215	12792	24	98	29	.077	1.9	8	2.2	34	19.9
5 10 PCT T	22	.020	11.24	44	11.834	8165	16	28	11	.057	.9	2	.6	11	18.2
6 30 PCT T	23	.060	13.19	94	13.225	12792	24	117	31	.077	1.9	9	2.4	34	19.9
7 90 PCT T	37	.170	14.73	110	14.940	24177	69	596	63	.113	7.8	67	7.8	100	3.9
8 30 PCT T	20	.060	13.19	75	13.222	12792	21	117	27	.077	1.6	9	2.1	34	19.9
9 C.T.	28	.010	6.14	36	6.170	1996	10	7	4	.193	1.9	1	.6	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.8	4	.8		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------											.9	5	1.1		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------											.8	4	.9		

FOUR CYCLE COMPOSITE =
HC- NDIR 0.35(.9) + 0.65(.8) = .292 GM/BHP HR
CO- NDIR 0.35(4.9) + 0.65(4.4) = 4.589 GM/BHP HR
NO2-NDIR 0.35(1.1) + 0.65(.9) = .921 GM/BHP HR
CORRECTED NO2 = .864 GM/BHP HR
BSFC = .721 LB/BHP HR

MODE	CONCENTRATION AS MEASURED HC-FID	CO	CO2	NO-CL	TOTAL CARBON	FUEL CONS.	CALCULATED GM/HR HC	CO	NO2	WT. FACT.	WEIGHTED GM/HR HC-FID	CO	NO2-CL	HP	MAN. VAC.
1 IDLE	241	.030	10.70	45	10.759	2087	5	12	3	.232	1.1	3	.7	0	17.5
2 30 PCT T	305	.060	12.86	105	12.950	12792	30	120	34	.077	2.3	9	2.7	34	19.9
3 60 PCT T	359	.120	13.58	151	13.736	18199	47	320	66	.147	7.0	47	9.7	67	9.9
4 30 PCT T	217	.060	13.30	40	13.082	12792	21	119	13	.077	1.6	9	1.0	34	19.9
5 10 PCT T	150	.030	11.66	41	11.706	8165	11	42	9	.057	.6	2	.5	11	18.2
6 30 PCT T	245	.070	13.00	55	13.096	12792	24	138	18	.077	1.8	11	1.4	34	19.9
7 90 PCT T	385	.180	13.73	100	13.948	24177	67	630	58	.113	7.5	71	6.5	100	3.9
8 30 PCT T	150	.070	13.19	60	13.225	12792	15	137	19	.077	1.1	11	1.5	34	19.9
9 C.T.	311	.010	6.13	15	6.171	1996	10	7	2	.193	1.9	1	.2	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.8	5	.7		
1 IDLE	241	.030	10.70	45	10.759	2087	5	12	3	.232	1.1	3	.7	0	17.5
2 30 PCT T	139	.040	13.00	40	13.059	12792	19	79	30	.077	1.4	6	2.3	34	19.9
3 60 PCT T	201	.110	13.73	44	13.860	18199	26	291	40	.147	3.9	43	5.9	67	9.9
4 30 PCT T	127	.060	13.14	53	13.213	12792	12	117	17	.077	.9	9	1.3	34	19.9
5 10 PCT T	43	.020	11.55	14	11.589	8165	7	28	3	.057	.4	2	.2	11	18.2
6 30 PCT T	125	.060	13.00	55	13.077	12792	17	119	18	.077	1.3	9	1.4	34	19.9
7 90 PCT T	325	.170	13.74	60	13.933	24177	56	596	46	.113	6.4	67	5.2	100	3.9
8 30 PCT T	127	.070	13.14	45	13.223	12792	12	137	14	.077	.9	11	1.1	34	19.9
9 C.T.	371	.010	6.27	12	6.247	1996	9	6	1	.193	1.2	1	.2	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.5	5	.6		
1 IDLE	109	.020	11.14	4	11.070	2087	2	6	0	.232	.5	2	.0	0	17.5
2 30 PCT T	143	.040	13.19	94	13.148	12792	18	78	28	.077	1.4	6	2.2	34	19.9
3 60 PCT T	219	.110	13.58	[illegible]	13.713	18199	29	294	44	.147	4.3	43	6.5	67	9.9
4 30 PCT T	134	.060	13.14	55	13.213	12792	13	117	18	.077	1.0	9	1.4	34	19.9
5 10 PCT T	38	.020	11.65	14	11.690	8165	7	28	3	.057	.4	2	.2	11	18.2
6 30 PCT T	141	.060	13.19	55	13.213	12792	13	117	18	.077	1.0	9	1.4	34	19.9
7 90 PCT T	410	.160	13.74	45	13.921	24177	44	561	43	.113	6.1	63	4.9	100	3.9
8 30 PCT T	91	.070	13.14	[illegible]	13.219	12792	9	137	16	.077	.7	11	1.2	34	19.9
9 C.T.	244	.010	6.01	14	6.044	1996	8	7	1	.193	1.2	1	.2	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.5	5	.6		
1 IDLE	109	.020	11.14	4	11.070	2087	2	8	0	.232	.5	2	.0	0	17.5
2 30 PCT T	125	.040	13.14	25	13.148	12792	17	78	24	.077	1.3	6	1.9	34	19.9
3 60 PCT T	182	.100	13.74	100	13.849	18199	24	265	43	.147	3.6	39	6.4	67	9.9
4 30 PCT T	116	.050	13.14	53	13.202	12792	11	98	17	.077	.9	8	1.3	34	19.9
5 10 PCT T	93	.020	11.29	14	11.819	8165	6	28	3	.057	.4	2	.2	11	18.2
6 30 PCT T	183	.060	14.14	53	13.218	12792	14	117	17	.077	1.4	9	1.3	34	19.9
7 90 PCT T	433	.170	13.73	64	13.943	24177	58	596	36	.113	6.5	67	4.1	100	3.9
8 30 PCT T	127	.060	14.14	45	13.213	12792	12	117	14	.077	.9	9	1.1	34	19.9
9 C.T.	268	.010	6.14	12	6.166	1996	9	7	1	.193	1.2	1	.2	0	24.9
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------											.5	4	.5		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------											.7	5	.7		
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------											.5	4	.5		

FOUR CYCLE COMPOSITE =
HC- FID 0.35(.7) + 0.65(.5) = .560 GM/BHP HR
CO- NDIR 0.35(4.9) + 0.65(4.5) = 4.592 GM/BHP HR
NO2-CL 0.35(.7) + 0.65(.5) = .576 GM/BHP HR
CORRECTED NO2 = .540 GM/BHP HR
BSFC = .721 LB/BHP HR

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                        TABLE G-58. [illegible] EMISSIONS BY NINE-MODE EPA
ENGINE 7-1    TEST 123 RUN 4  [illegible] CAT. [illegible] 10-19-73      K = .938      HUM = 57.9  GR/LB
-------------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE            HC     CO     CO2     NO       CARBON   CONS.      HC      CO     NO2    FACT.    HC       CO    NO2    HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          24    .020   10.46    23      10.910    2087        6       8      5    .232     1.3       2    1.1     0    17.5
2 30 PCT T      43    .050   12.46   160      12.996   12792       35     100     52    .077     2.7       8    4.0    34    19.9
3 60 PCT T      47    .110   13.58   173      13.730   18144       53     294     76    .147     7.8      43   11.2    67     9.9
4 30 PCT T      28    .060   13.00   122      13.090   12792       30     118     90    .077     2.3       9    4.0    34    19.9
5 10 PCT T      21    .040   11.66    73      11.715    8165       17      42     17    .057     1.0       2    1.0    11    18.2
6 30 PCT T      28    .060   12.90   128      12.990   12792       30     119     42    .077     2.3       9    3.2    34    19.9
7 90 PCT T      47    .120   14.73   160      13.890   24177       69     596     92    .113     7.8      67   10.4   100     3.9
8 30 PCT T      25    .020   13.14    94      13.237   12972       26     139     32    .077     2.0      11    2.5    34    19.9
9 C.T.          24    .010    6.29    48       6.330    1996       10       6      5    .143     1.4       1     .7     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .9       5    1.1
1 IDLE          24    .020   10.46    23      10.910    2087        6       8      5    .232     1.3       2    1.1     0    17.5
2 30 PCT T      23    .030   13.00   115      13.055   12792       24      59     37    .077     1.9       5    2.9    34    19.9
3 60 PCT T      28    .100   13.74   135      13.860   18144       40     264     59    .147     5.8      39    8.6    67     9.9
4 30 PCT T      24    .050   13.14    90      13.215   12792       24      98     29    .077     1.9       8    2.2    34    19.9
5 10 PCT T      19    .020   11.65    68      11.701    8165       14      28     11    .057      .8       2     .6    11    18.2
6 30 PCT T      21    .050   13.00    43      13.075   12792       24      99     32    .077     1.9       8    2.5    34    19.9
7 90 PCT T      43    .150   13.73   113      13.916   24177       63     526     63    .113     7.0      59    7.2   100     3.9
8 30 PCT T      23    .060   13.14    84      13.225   12972       24     119     28    .077     1.9       9    2.1    34    19.9
9 C.T.          24    .010    6.45    36       6.490    1996        9       6      4    .143     1.3       1     .5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7       4     .9
1 IDLE          20    .020   11.04    36      11.082    2087        4       8      2    .232      .9       2     .5     0    17.5
2 30 PCT T      25    .030   13.00   110      13.057   12792       26      59     36    .077     2.0       5    2.8    34    19.9
3 60 PCT T      28    .110   13.73   127      13.870   18144       40     291     55    .147     5.8      43    8.1    67     9.9
4 30 PCT T      23    .050   13.07    85      13.145   12792       24      98     27    .077     1.9       8    2.1    34    19.9
5 10 PCT T      21    .020   11.70    68      11.744    8165       17      28     11    .057     1.0       2     .6    11    18.2
6 30 PCT T      23    .050   13.00    88      13.075   12792       24      99     32    .077     1.9       8    2.5    34    19.9
7 90 PCT T      35    .170   13.73   110      13.938   24177       66     596     63    .113     7.4      67    7.2   100     3.9
8 30 PCT T      23    .060   13.14    85      13.228   12972       24     119     28    .077     1.9       9    2.1    34    19.9
9 C.T.          29    .010    6.29    36       6.330    1996       10       6      4    .143     1.4       1     .5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7       4     .8
1 IDLE          20    .020   11.04    36      11.082    2087        4       8      2    .232      .9       2     .5     0    17.5
2 30 PCT T      28    .040   14.00   110      13.060   12792       30      59     36    .077     2.3       5    2.8    34    19.9
3 60 PCT T      28    .100   13.74   127      13.860   18144       40     264     53    .147     5.8      39    7.9    67     9.9
4 30 PCT T      23    .050   14.00    85      13.075   12792       24      99     28    .077     1.9       8    2.1    34    19.9
5 10 PCT T      20    .020   11.60    44      11.642    8165       15      28     11    .057      .9       2     .6    11    18.2
6 30 PCT T      28    .050   13.00    85      13.080   12792       30      99     28    .077     2.3       8    2.1    34    19.9
7 90 PCT T      43    .160   13.73   110      13.926   24177       62     561     63    .113     7.0      63    7.2   100     3.9
8 30 PCT T      23    .060   13.14    85      13.225   12972       24     119     28    .077     1.9       9    2.1    34    19.9
9 C.T.          24    .010    6.45    36       6.490    1996        9       6      4    .143     1.3       1     .5     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .8       4     .8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .8       4    1.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .7       4     .8
FOUR CYCLE COMPOSITE =                  HC= NDIR 0.35(     .8) + 0.65(     .7) =      .770   GM/BHP HR
                                        CO= NDIR 0.35(    4.4) + 0.65(    4.3) =     4.337   GM/BHP HR
                                        NO2=NDIR 0.35(    1.0) + 0.65(     .8) =      .876   GM/BHP HR
                                                            CORRECTED NO2 =      .822   GM/BHP HR
                                                                     BSFC =      .722   LB/BHP HR


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                CONCENTRATION AS MEASURED      TOTAL    FUEL       CALCULATED GM/HR      WT.      WEIGHTED GM/HR              MAN.
MODE            HC-FID   CO    CO2   NO-CL     CARBON   CONS.      HC      CO     NO2    FACT.  HC-FID     CO  NO2-CL   HP    VAC.
-------------------------------------------------------------------------------------------------------------------
1 IDLE          210   .020   10.46    21      10.901    2087        9       8      1    .232      .9       2     .3     0    17.5
2 30 PCT T      273   .050   12.46   101      12.932   12792       27     100     33    .077     2.1       8    2.6    34    19.9
3 60 PCT T      445   .110   13.58   109      13.724   18144       46     294     48    .147     6.7      43    7.0    67     9.9
4 30 PCT T      219   .060   13.00    65      13.082   12792       21     119     21    .077     1.6       9    1.6    34    19.9
5 10 PCT T      156   .030   11.66    25      11.706    8165       11      42      6    .057      .6       2     .3    11    18.2
6 30 PCT T      242   .060   12.90    74      12.984   12792       24     119     24    .077     1.8       9    1.9    34    19.9
7 90 PCT T      385   .170   14.73   100      13.918   24177       67     596     58    .113     7.5      67    6.5   100     3.9
8 30 PCT T      155   .070   13.14    50      13.225   12972       15     139     16    .077     1.2      11    1.3    34    19.9
9 C.T.          417   .010    6.29     5       6.332    1996       10       6      1    .143     1.4       1     .1     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .7       5     .7
1 IDLE          214   .020   10.46    21      10.901    2087        9       8      1    .232      .9       2     .3     0    17.5
2 30 PCT T      194   .030   13.00    74      13.050   12792       19      59     24    .077     1.5       5    1.9    34    19.9
3 60 PCT T      204   .100   13.74    71      13.850   18144       27     265     31    .147     3.9      39    4.5    67     9.9
4 30 PCT T      147   .050   13.14    49      13.204   12792       13      98     16    .077     1.0       8    1.2    34    19.9
5 10 PCT T      104   .020   11.66    29      11.690    8165        7      28      9    .057      .4       2     .5    11    18.2
6 30 PCT T      175   .050   14.00    53      14.067   12792       17      99     17    .077     1.3       8    1.3    34    19.9
7 90 PCT T      335   .150   14.73    55      13.914   24177       58     527     32    .113     6.6      59    3.6   100     3.9
8 30 PCT T      134   .060   13.14    39      13.213   12972       13     119     13    .077     1.0       9    1.0    34    19.9
9 C.T.          264   .010    6.45     6       6.487    1996        8       6      1    .143     1.2       1     .1     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .6       4     .4
1 IDLE          134   .020   11.04     9      11.073    2087        3       8      0    .232      .6       2     .1     0    17.5
2 30 PCT T      136   .040   13.00    69      13.050   12792       19      59     22    .077     1.5       5    1.7    34    19.9
3 60 PCT T      201   .110   13.73    74      13.860   18144       26     291     34    .147     3.9      43    5.0    67     9.9
4 30 PCT T      133   .050   13.07    46      13.133   12792       13      98     15    .077     1.0       8    1.1    34    19.9
5 10 PCT T      108   .020   11.70    13      11.731    8165        7      28      3    .057      .4       2     .2    11    18.2
6 30 PCT T      171   .050   13.00    53      13.067   12792       17      99     17    .077     1.3       8    1.3    34    19.9
7 90 PCT T      345   .170   13.73    55      13.934   24177       58     596     33    .113     6.6      67    3.8   100     3.9
8 30 PCT T      131   .060   13.14    43      13.213   12972       13     119     14    .077     1.0       9    1.1    34    19.9
9 C.T.          252   .010    6.29     7       6.325    1996        8       6      1    .143     1.1       1     .1     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .5       4     .4
1 IDLE          134   .020   11.04     9      11.073    2087        3       8      0    .232      .6       2     .1     0    17.5
2 30 PCT T      186   .030   13.00    65      13.044   12792       18      59     21    .077     1.4       5    1.6    34    19.9
3 60 PCT T      187   .100   13.73    73      13.844   18144       25     265     34    .147     3.6      39    5.1    67     9.9
4 30 PCT T      127   .050   13.00    41      13.063   12792       12      99     13    .077     1.0       8    1.0    34    19.9
5 10 PCT T      101   .020   11.60     9      11.630    8165        7      28      2    .057      .4       2     .1    11    18.2
6 30 PCT T      183   .050   13.00    60      13.068   12792       18      99     16    .077     1.4       8    1.3    34    19.9
7 90 PCT T      339   .150   13.73    65      13.924   24177       59     561     32    .113     6.6      63    3.6   100     3.9
8 30 PCT T      139   .060   13.14    45      13.213   12972       13     119     15    .077     1.0       9    1.1    34    19.9
9 C.T.          245   .010    6.45     6       6.486    1996        8       6      1    .143     1.2       1     .1     0    24.9
----------------CYCLE COMPOSITE IN GM/BHP HR----------------------------------------     .5       4     .4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------     .6       4     .6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------     .5       4     .4
FOUR CYCLE COMPOSITE =                  HC= FID  0.35(     .6) + 0.65(     .5) =      .573   GM/BHP HR
                                        CO= NDIR 0.35(    4.4) + 0.65(    4.3) =     4.339   GM/BHP HR
                                        NO2=CL   0.35(     .6) + 0.65(     .4) =      .480   GM/BHP HR
                                                            CORRECTED NO2 =      .450   GM/BHP HR
                                                                     BSFC =      .722   LB/BHP HR
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TABLE G-59. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-00 TEST 119 RUN 1 1973 STANDARD 10-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	625	0.0	0	16.4	5.3	[illegible]	0	6455	1.310	6.66	30
2	1200	6.6	2	20.0	8.6	17.4	0	3350	.580	12.15	105
3	1200	24.9	6	19.1	9.4	16.2	0	2366	.800	12.21	176
4	1200	57.8	13	17.7	11.6	16.2	0	2550	1.060	12.60	523
5	1200	78.2	18	16.2	12.7	16.2	0	2554	.680	12.66	460
6	1200	158.0	36	10.8	19.4	17.4	0	2242	.500	12.31	2560
7	1200	235.0	54	6.3	29.8	14.5	0	3660	4.310	11.04	860
8	1200	259.0	54	4.8	31.7	14.6	0	3422	3.660	11.63	1163
9	1200	289.0	66	2.2	33.7	14.9	0	2740	2.250	11.70	1600
10	1200	316.0	72	.2	37.0	15.1	0	3126	2.090	11.76	1900
11	625	0.0	0	16.9	4.9	17.9	0	5422	1.860	4.66	41
12	1200	0.0	0	22.4	5.4	26.2	0	28961	.740	4.66	11
13	2300	309.0	135	.6	66.3	13.5	0	2426	2.170	12.43	2200
14	2300	282.0	123	2.5	62.5	13.5	0	2611	2.830	12.14	1660
15	2300	252.0	110	4.1	57.5	13.2	0	2677	3.610	12.72	1600
16	2300	230.0	101	6.1	56.0	13.2	0	2964	3.250	12.66	1750
17	2300	154.0	67	11.2	36.6	15.5	0	2270	.810	13.73	3850
18	2300	76.0	33	16.7	25.6	14.2	0	2444	1.610	13.43	1935
19	2300	55.0	24	18.1	22.6	14.4	0	1993	1.340	13.68	1450
20	2300	24.0	11	19.9	17.6	15.6	0	933	.560	13.66	660
21	2300	6.6	3	20.6	15.7	16.1	0	985	.410	13.14	395
22	625	0.0	0	17.0	4.9	19.6	0	5086	1.410	6.72	34
23	2300	0.0	0	25.4	5.5	39.5	0	16604	.500	2.12	6

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	133.6	548	2.1	.070	0.0	I	F	R	F
2	0.0	100.8	353	10.5	.060	.1	0.0	66.86	233.8	7.0
3	0.0	75.2	516	15.7	.060	.3	0.0	13.22	90.8	3.3
4	0.0	98.0	810	65.7	.050	.7	0.0	7.42	61.3	5.0
5	0.0	108.8	586	134.3	.030	.5	0.0	6.04	32.5	7.5
6	0.0	187.7	706	566.3	.060	2.2	0.0	5.20	19.5	15.7
7	0.0	307.1	7493	246.6	0.000	0.0	0.0	5.72	139.5	4.6
8	0.0	316.8	6544	287.0	.040	2.4	0.0	5.35	115.7	6.0
9	0.0	292.6	4566	567.2	0.000	0.0	0.0	4.43	73.5	6.6
10	0.0	376.8	4990	711.4	0.000	0.0	0.0	5.22	69.1	9.8
11	0.0	99.9	692	2.5	.020	0.0	I	E	H	P
12	0.0	862.4	445	1.0	.120	0.0	I	R	H	E
13	0.0	460.5	8321	1386.5	.025	3.4	0.0	3.40	61.5	10.2
14	0.0	456.1	9995	1043.8	.055	6.8	0.0	3.69	60.9	8.5
15	0.0	419.4	11583	832.2	.035	3.9	0.0	3.80	105.0	7.5
16	0.0	452.6	11566	887.1	.060	6.0	0.0	4.49	114.8	8.8
17	0.0	254.6	1504	1434.1	.060	4.0	0.0	3.78	22.2	21.3
18	0.0	186.1	2471	462.5	0.000	0.0	0.0	5.59	74.2	14.7
19	0.0	135.1	1823	326.6	.065	1.6	0.0	5.61	75.7	13.6
20	0.0	52.3	634	122.5	0.000	0.0	0.0	4.98	60.4	11.7
21	0.0	51.4	432	66.0	0.000	0.0	0.0	17.76	144.5	22.7
22	0.0	106.3	595	2.4	.080	0.0	I	R	R	E
23	0.0	694.8	441	1.2	.060	0.0	I	F	H	H

CYCLE COMPOSITE			
	HC	9.893	GRAM/BHP HR
	CO	85.685	GRAM/BHP HR
	NO2	10.668	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.646	LB/BHP HR

TABLE G-60. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-00 TEST 118 RUN 2 1973 STANDARD 10-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.9	5.2	20.5	0	4160	1.720	8.52	25
2	1200	6.6	2	20.0	9.0	17.5	0	2725	.670	11.66	58
3	1200	24.9	6	19.4	9.5	16.8	0	1931	.850	12.05	175
4	1200	56.5	13	17.7	11.3	16.6	0	2297	.950	12.05	420
5	1200	78.8	18	16.3	12.8	17.1	0	2122	.550	12.05	840
6	1200	157.6	36	10.8	19.0	17.6	0	2196	.450	11.66	2300
7	1200	236.3	54	6.3	29.9	14.7	0	3229	4.050	10.33	790
8	1200	257.3	59	4.8	31.4	14.7	0	3346	3.460	11.04	980
9	1200	288.9	66	2.3	33.5	15.2	0	2740	2.250	11.74	1425
10	1200	317.7	73	.2	36.8	15.2	0	3021	2.050	11.42	1625
11	525	0.0	0	16.9	5.0	18.2	0	5231	1.720	5.23	35
12	1200	0.0	0	22.4	5.4	26.8	0	28114	.760	4.52	11
13	2300	308.6	135	.6	66.3	13.9	0	2433	2.250	13.43	2175
14	2300	283.6	124	2.5	61.9	13.3	0	2693	2.910	11.53	1750
15	2300	253.4	111	4.8	57.2	13.0	0	2980	4.160	12.86	1575
16	2300	229.8	101	6.3	56.0	13.0	0	2883	4.110	12.45	1550
17	2300	153.6	67	11.2	36.9	14.6	0	2414	.970	13.73	2200
18	2300	76.2	33	16.8	25.6	14.2	0	2509	1.590	13.56	1915
19	2300	55.1	24	18.1	22.4	14.5	0	1991	1.290	13.56	1365
20	2300	23.6	10	19.5	17.8	15.2	0	1147	.710	13.58	710
21	2300	6.6	3	20.7	15.8	15.0	0	1016	.500	13.43	400
22	525	0.0	0	16.8	5.0	15.2	0	4630	1.750	5.33	32
23	2300	0.0	0	25.4	5.1	44.5	0	14044	.500	3.05	7

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	92.1	764	2.1	.020	0.0	I	F	F	F
2	0.0	88.4	438	10.5	.060	.1	0.0	58.63	290.7	7.0
3	0.0	63.5	565	18.9	.060	.3	0.0	11.17	99.3	3.3
4	0.0	88.7	772	53.9	.050	.6	0.0	6.87	59.8	4.2
5	0.0	95.9	538	133.5	.030	.5	0.0	5.32	29.9	7.4
6	0.0	153.5	635	533.8	.060	2.2	0.0	4.26	17.6	14.8
7	0.0	297.9	7547	241.9	0.000	0.0	0.0	5.52	139.8	4.5
8	0.0	321.2	6711	312.4	.060	3.4	0.0	5.46	114.1	5.3
9	0.0	290.9	4825	502.2	0.000	0.0	0.0	4.41	73.1	7.6
10	0.0	353.3	4843	631.0	0.000	0.0	0.0	4.87	66.7	8.7
11	0.0	103.4	687	2.3	.020	0.0	I	F	F	F
12	0.0	849.0	476	1.1	.120	0.0	I	F	F	F
13	0.0	459.5	8584	1363.8	.025	3.4	0.0	3.40	63.5	10.1
14	0.0	512.4	11375	1105.3	.055	6.8	0.0	4.13	91.6	8.9
15	0.0	446.5	12590	783.4	.035	3.9	0.0	4.02	113.5	7.1
16	0.0	434.7	12517	775.8	.060	6.0	0.0	4.32	124.4	7.7
17	0.0	270.4	2195	1376.1	.060	4.0	0.0	4.02	32.6	20.5
18	0.0	188.9	2419	478.3	0.000	0.0	0.0	5.66	72.5	14.3
19	0.0	134.2	1757	310.7	.065	1.6	0.0	5.56	72.9	12.9
20	0.0	64.3	804	132.1	0.000	0.0	0.0	6.22	77.8	12.8
21	0.0	51.9	516	67.8	0.000	0.0	0.0	17.95	178.5	23.5
22	0.0	91.0	695	2.1	.080	0.0	I	F	F	F
23	0.0	668.4	474	1.1	.060	0.0	I	F	F	F

CYCLE COMPOSITE
HC 9.639 GRAM/BHP HR
CO 92.334 GRAM/BHP HR
NO2 10.208 GRAM/BHP HR
ALDE 0.000 GRAM/BHP HR
BSFC .647 LB/BHP HR

TABLE G-61. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 7-00 TEST 118 RUN 3 1973 STANDARD 10-16-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.9	5.1	19.1	0	4569	1.900	9.02	33
2	1200	7.0	2	20.0	8.7	17.3	0	4335	.640	11.41	98
3	1200	26.0	6	19.1	9.6	16.6	0	2183	.840	12.05	175
4	1200	56.0	13	17.7	11.4	16.1	0	2469	1.060	12.18	430
5	1200	79.0	18	16.2	12.9	16.7	0	2348	.610	12.19	910
6	1200	158.0	36	10.8	18.9	17.6	0	2279	.430	11.66	2363
7	1200	236.0	54	6.4	30.2	14.5	0	3457	4.110	10.33	770
8	1200	259.0	59	4.8	31.4	14.6	0	3257	3.460	10.92	1050
9	1200	269.0	66	2.2	33.8	15.0	0	2825	2.330	11.74	1425
10	1200	316.0	72	.2	36.7	14.9	0	3108	2.170	11.92	1625
11	525	0.0	0	17.0	5.0	17.8	0	5325	2.060	9.66	40
12	1200	0.0	0	22.4	5.4	27.2	0	28453	.730	4.25	11
13	2300	307.0	134	.6	66.3	13.9	0	2420	2.130	12.86	2188
14	2300	282.0	123	2.2	62.3	13.5	0	2516	2.750	12.86	1800
15	2300	252.0	110	4.8	57.3	13.1	0	2844	3.660	12.45	1550
16	2300	230.0	101	6.3	55.8	13.1	0	3015	3.250	12.31	1700
17	2300	154.0	67	11.3	36.8	14.6	0	2437	.950	13.43	3700
18	2300	76.0	33	16.7	25.5	14.1	0	2592	1.750	13.29	1813
19	2300	55.0	24	18.4	22.2	14.4	0	2016	1.360	13.29	1375
20	2300	24.0	11	19.8	17.6	15.4	0	1051	.650	13.29	690
21	2300	7.0	3	20.8	15.5	15.9	0	1082	.400	13.14	400
22	525	0.0	0	16.9	4.9	18.3	0	6244	1.590	6.62	32
23	2300	0.0	0	25.4	5.3	42.5	0	16131	.480	3.20	7

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	92.9	780	2.2	.070	0.0	I	[illegible]	[illegible]	[illegible]
2	0.0	137.0	409	10.3	.060	.1	0.0	85.68	255.5	6.4
3	0.0	72.5	564	19.3	.060	.4	0.0	12.21	94.9	3.2
4	0.0	94.7	621	54.7	.050	.6	0.0	7.40	64.2	4.3
5	0.0	105.5	554	135.7	.030	.5	0.0	5.85	30.7	7.5
6	0.0	155.6	605	546.0	.060	2.2	0.0	4.39	16.7	15.1
7	0.0	320.3	7692	236.8	0.000	0.0	0.0	5.94	142.6	4.4
8	0.0	315.5	6769	337.6	.040	2.4	0.0	5.33	114.4	5.7
9	0.0	301.8	5028	505.4	0.000	0.0	0.0	4.57	76.1	7.7
10	0.0	359.3	5067	623.7	0.000	0.0	0.0	4.98	70.2	8.6
11	0.0	59.5	767	2.5	.070	0.0	I	[illegible]	[illegible]	[illegible]
12	0.0	890.6	462	1.1	.120	0.0	I	[illegible]	[illegible]	[illegible]
13	0.0	477.7	8495	1434.2	.025	3.4	0.0	3.55	63.2	10.7
14	0.0	447.6	10015	1062.0	.055	6.8	0.0	3.62	61.1	8.6
15	0.0	450.9	11721	815.8	.035	3.9	0.0	4.09	106.2	7.4
16	0.0	466.4	11718	873.1	.060	6.0	0.0	4.63	116.3	8.7
17	0.0	237.4	2276	1398.4	.060	4.0	0.0	4.11	33.9	20.7
18	0.0	195.5	2727	453.9	0.000	0.0	0.0	5.97	81.9	13.6
19	0.0	136.7	1863	309.5	.065	1.6	0.0	5.67	77.3	12.9
20	0.0	59.7	746	130.2	0.000	0.0	0.0	5.68	71.0	12.4
21	0.0	55.8	416	68.4	0.000	0.0	0.0	18.19	135.2	22.3
22	0.0	125.9	647	2.1	.080	0.0	I	[illegible]	[illegible]	[illegible]
23	0.0	732.7	440	1.1	.060	0.0	I	[illegible]	[illegible]	[illegible]

CYCLE COMPOSITE

HC	10.140	GRAM/BHP HR
CO	87.918	GRAM/BHP HR
NO2	10.515	GRAM/BHP HR
ALDE	0.000	GRAM/BHP HR
BSFC	.647	LB/BHP HR

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                       TABLE G-62. MASS EMISSIONS BY 23 MODE PROCEDURE
                       ENGINE 7-0   TEST 100 RUN-1   1973 CALIF ENGINE      09-19-73
--------------------------------------------------------------------------------------
            DYNA.         MAN. FUEL    A/F                DRY CONCENTRATION
MODE SPEED  LOAD    HP   VAC. LB/HR   RATIO   ALDE.    HC       CO       CO2      NO
--------------------------------------------------------------------------------------
  1   525     0.0    0  16.9    5.3   19.1        0  4506     .500    10.21      27
  2  1200     7.0    2  18.4   11.0   15.3        0   469     .520    14.03      98
  3  1200    26.0    6  17.5   11.6   19.0        0   228     .170    11.28     108
  4  1200    59.0   13  15.3   14.0   18.8        0   332     .140    11.41     270
  5  1200    83.0   14  13.8   15.4   18.7        0   381     .140    11.41     420
  6  1200   164.0   37   9.1   21.5   17.5        0   822     .200    12.05    1375
  7  1200   247.0   56   5.2   31.4   14.5        0   840    2.170    12.72     575
  8  1200   270.0   62   3.8   33.0   14.7        0   937    1.980    12.72     863
  9  1200   303.0   69   1.5   35.8   15.1        0  1257    1.430    12.59    1500
 10  1200   327.0   75    .2   37.4   15.1        0  1555    1.500    12.59    1550
 11   525     0.0    0  16.8    5.1   20.4        0  5670     .330     9.44      32
 12  1200     0.0    0  21.4    5.2   20.9        0 29873     .280     6.95      13
 13  2300   310.0  136    .5   67.7   14.9        0    49     .240    14.81    1525
 14  2300   288.0  126   2.3   64.2   14.6        0    35     .520    14.81    1150
 15  2300   256.0  112   4.7   58.0   14.6        0    26     .520    14.97    1000
 16  2300   234.0  102   6.3   55.2   14.5        0    38     .590    14.97     850
 17  2300   156.0   68  11.2   38.1   16.8        0    65     .110    13.00    1500
 18  2300    77.0   34  16.3   26.1   18.0        0    62     .100    12.05     563
 19  2300    56.0   25  17.5   24.0   14.8        0   138     .590    14.65     400
 20  2300    25.0   11  18.7   20.6   15.1        0    35     .360    14.65     250
 21  2300     7.0    3  19.6   18.1   15.3        0    42     .240    14.49     170
 22   525     0.0    0  16.7    5.1   20.3        0  8287     .330     9.44      23
 23  2300     0.0    0  24.9    5.4   22.7        0 21257     .240     6.95      25
--------------------------------------------------------------------------------------
          CALCULATED GRAM/HP         WT.      WT.  BRAKE SPECIFIC GRAM/BHP-HR
MODE ALDE.     HC      CO     NO2   FAC.      HP  ALDE.      HC       CO      NO2
--------------------------------------------------------------------------------------
  1   0.0    97.1     218     1.9   .070      0.0     I        R        R        R
  2   0.0    16.0     359    11.1   .060       .1   0.0    10.01    224.5      7.0
  3   0.0    10.4     157    16.4   .060       .4   0.0     1.76     26.5      2.8
  4   0.0    18.2     155    49.1   .050       .7   0.0     1.35     11.5      3.6
  5   0.0    23.0     170    84.1   .030       .6   0.0     1.21      9.0      4.4
  6   0.0    65.0     319   361.0   .060      2.2   0.0     1.73      8.5      9.6
  7   0.0    79.9    4169   181.6  0.000      0.0   0.0     1.42     73.9      3.2
  8   0.0    94.8    4047   284.9   .040      2.5   0.0     1.54     65.6      4.7
  9   0.0   144.3    3316   571.7  0.000      0.0   0.0     2.08     47.9      8.3
 10   0.0   185.2    3608   612.8  0.000      0.0   0.0     2.48     48.3      8.2
 11   0.0   126.9     149     2.4   .070      0.0     I        R        R        R
 12   0.0   689.6     131     1.0   .120      0.0     I        R        R        R
 13   0.0    10.0     989  1032.7   .025      3.4   0.0      .07      7.3      7.6
 14   0.0     6.7    1995   725.1   .055      6.9   0.0      .05     15.8      5.7
 15   0.0     4.5    1784   563.8   .035      3.9   0.0      .04     15.4      5.0
 16   0.0     6.1    1917   454.0   .060      6.1   0.0      .06     18.7      4.4
 17   0.0     8.6     293   656.2   .060      4.1   0.0      .13      4.3      9.6
 18   0.0     6.1     197   182.0  0.000      0.0   0.0      .18      5.8      5.4
 19   0.0     9.9     851    94.8   .065      1.6   0.0      .40     34.7      3.9
 20   0.0     2.2     453    51.7  0.000      0.0   0.0      .20     41.3      4.7
 21   0.0     2.3     270    31.4  0.000      0.0   0.0      .76     88.1     10.3
 22   0.0   180.9     145     1.7   .080      0.0     I        R        R        R
 23   0.0   569.0     127     2.2   .060      0.0     I        R        R        R

CYCLE COMPOSITE      HC      4.929    GRAM/BHP HR
                     CO     20.619    GRAM/BHP HR
                     NO2     6.115    GRAM/BHP HR
                     ALDE    0.000    GRAM/BHP HR
                     BSFC     .665      LB/BHP HR
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                        TABLE G-63. MASS EMISSIONS BY 23 MODE PROCEDURE
                        ENGINE 7-0   TEST 100 RUN-2   1973 CALIF ENGINE        09-19-73
-----------------------------------------------------------------------------------------
               DYNA.          MAN. FUEL    A/F                DRY CONCENTRATION
MODE SPEED     LOAD     HP   VAC. LB/HR   RATIO   ALDE.     HC        CO       CO2     NO
-----------------------------------------------------------------------------------------
  1    525      0.0      0   16.5   5.0    21.1       0   8242      .210      8.92     26
  2   1200      6.0      1   18.2  11.5    15.6       0    339      .280     13.73     87
  3   1200     25.0      6   17.4  12.0    21.6       0    276      .130     10.92    131
  4   1200     58.0     13   15.1  14.2    21.2       0    359      .120     11.04    285
  5   1200     80.0     18   13.6  15.3    20.9       0    414      .120     11.16    450
  6   1200    159.0     36    9.2  21.2    19.2       0    833      .190     11.79   1400
  7   1200    239.0     55    5.5  31.3    15.0       0    740     2.090     12.86    600
  8   1200    261.0     60    4.2  32.2    15.2       0    951     1.830     12.86    850
  9   1200    294.0     67    1.8  34.2    15.8       0   1116     1.310     12.86   1537
 10   1200    323.0     74     .2  37.5    15.9       0   1583     1.420     12.72   1650
 11    525      0.0      0   16.2   5.0    19.6       0   8251      .240      9.02     29
 12   1200      0.0      0   21.9   4.9    20.6       0  30945      .300      6.95     13
 13   2300    309.0    135     .6  68.7    14.9       0     49      .340     14.65   1475
 14   2300    284.0    124    2.3  63.7    14.6       0     42      .550     14.65   1175
 15   2300    253.0    111    4.6  57.7    14.6       0     35      .500     14.65   1012
 16   2300    231.0    101    6.2  54.2    14.5       0     39      .680     14.65    812
 17   2300    154.0     67   11.1  37.3    17.0       0     69      .120     12.86   1462
 18   2300     77.0     34   16.2  26.0    18.2       0     65      .110     12.05    575
 19   2300     55.0     24   16.8  25.0    19.8       0    199      .560     14.42    462
 20   2300     25.0     11   18.4  21.3    15.2       0     53      .450     14.18    287
 21   2300      6.0      3   19.3  18.4    15.4       0     35      .320     14.03    190
 22    525      0.0      0   16.3   5.0    18.7       0   8698      .310      9.12     23
 23   2300      0.0      0   24.8   5.2    22.6       0  21378      .240      7.21     12
-----------------------------------------------------------------------------------------
          CALCULATED GRAM/HR           WT.      WT.   BRAKE SPECIFIC GRAM/BHP-HR
MODE ALDE.    HC       CO      NO2   FAC.       HP   ALDE.      HC        CO      NO2
-----------------------------------------------------------------------------------------
  1   0.0   187.8      97      2.0   .070      0.0       I        R         R        R
  2   0.0    12.6     210     10.7   .060       .1     0.0     9.18     153.2      7.8
  3   0.0    13.5     129     21.4   .060       .3     0.0     2.37      22.6      3.7
  4   0.0    20.6     139     54.4   .050       .7     0.0     1.56      10.5      4.1
  5   0.0    25.4     149     91.6   .030       .5     0.0     1.39       8.1      5.0
  6   0.0    66.4     306    370.5   .060      2.2     0.0     1.83       8.4     10.2
  7   0.0    69.9    3990    188.2  0.000      0.0     0.0     1.28      73.1      3.4
  8   0.0    93.9    3652    278.8   .040      2.4     0.0     1.57      61.2      4.7
  9   0.0   121.3    2874    554.3  0.000      0.0     0.0     1.81      42.8      8.3
 10   0.0   188.3    3412    651.7  0.000      0.0     0.0     2.55      46.2      8.8
 11   0.0   185.6     109      2.2   .070      0.0       I        R         R        R
 12   0.0   664.9     130       .9   .120      0.0       I        R         R        R
 13   0.0    10.2    1427   1017.7   .025      3.4     0.0      .08      10.5      7.5
 14   0.0     8.0    2111    741.4   .055      6.8     0.0      .06      17.0      6.0
 15   0.0     6.1    1744    580.3   .035      3.9     0.0      .06      15.7      5.2
 16   0.0     6.2    2202    432.2   .060      6.1     0.0      .06      21.8      4.3
 17   0.0     9.0     316    632.4   .060      4.0     0.0      .13       4.7      9.4
 18   0.0     6.3     215    185.0  0.000      0.0     0.0      .19       6.4      5.5
 19   0.0    15.1     855    116.0   .065      1.6     0.0      .63      35.5      4.8
 20   0.0     3.5     600     62.9  0.000      0.0     0.0      .32      54.8      5.7
 21   0.0     2.0     376     36.7  0.000      0.0     0.0      .78     143.0     14.0
 22   0.0   191.5     138      1.7   .080      0.0       I        R         R        R
 23   0.0   525.9     119      1.0   .060      0.0       I        R         R        R

CYCLE COMPOSITE     HC       5.212    GRAM/BHP HR
                    CO      20.759    GRAM/BHP HR
                    NO2      6.232    GRAM/BHP HR
                    ALDE     0.000    GRAM/BHP HR
                    BSFC      .672      LB/BHP HR
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TABLE G-64. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-0 TEST 100 RUN-3 1973 CALIF ENGINE 09-19-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.3	5.1	18.6	0	8488	.300	9.23	29
2	1200	6.0	1	18.3	11.4	15.6	0	481	.420	13.73	104
3	1200	26.0	6	17.3	11.9	19.0	0	304	.170	11.04	134
4	1200	58.0	13	15.1	14.0	19.1	0	359	.140	11.04	275
5	1200	80.0	18	13.5	15.3	19.0	0	469	.140	11.16	460
6	1200	160.0	37	9.5	22.3	17.1	0	726	.350	12.31	1337
7	1200	241.0	55	5.3	31.4	14.6	0	712	2.130	12.86	587
8	1200	263.0	60	4.0	33.5	14.7	0	881	1.980	12.86	825
9	1200	295.0	67	1.8	34.9	15.2	0	1274	1.440	12.86	1500
10	1200	322.0	74	.2	37.5	15.1	0	1415	1.510	12.72	1525
11	525	0.0	0	16.3	4.9	18.7	0	8703	.380	9.12	25
12	1200	0.0	0	21.9	5.3	19.5	0	33602	.280	7.30	14
13	2300	307.0	134	.6	67.5	15.0	0	114	.640	14.03	1500
14	2300	284.0	124	2.4	64.7	14.5	0	42	.590	14.49	1150
15	2300	253.0	111	4.5	58.2	14.5	0	35	.580	14.49	975
16	2300	231.0	101	6.1	54.7	14.4	0	41	.720	14.49	813
17	2300	154.0	67	11.3	37.6	16.8	0	54	.120	12.86	1450
18	2300	76.0	33	16.3	26.0	18.1	0	47	.110	12.05	550
19	2300	55.0	24	17.4	24.9	14.7	0	259	.250	14.18	437
20	2300	25.0	11	18.4	21.3	15.0	0	89	.590	14.03	300
21	2300	6.0	3	19.3	18.8	15.1	0	32	.420	14.03	200
22	525	0.0	0	16.3	4.7	21.1	0	10312	.420	8.82	19
23	2300	0.0	0	24.9	5.1	22.4	0	22635	.240	7.08	13

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	189.2	135	2.1	.070	0.0	I	R	R	R
2	0.0	17.5	309	12.6	.060	.1	0.0	12.77	225.4	9.2
3	0.0	14.6	165	21.4	.060	.4	0.0	2.45	27.8	3.6
4	0.0	20.3	160	51.7	.050	.7	0.0	1.53	12.1	3.9
5	0.0	28.7	173	93.4	.030	.5	0.0	1.57	9.5	5.1
6	0.0	57.7	562	352.6	.060	2.2	0.0	1.58	15.4	9.6
7	0.0	67.3	4069	184.3	0.000	0.0	0.0	1.22	73.9	3.3
8	0.0	89.7	4071	278.8	.040	2.4	0.0	1.49	67.8	4.6
9	0.0	139.8	3192	546.4	0.000	0.0	0.0	2.07	47.4	8.1
10	0.0	167.4	3610	599.3	0.000	0.0	0.0	2.28	49.1	8.1
11	0.0	186.5	165	1.8	.070	0.0	I	R	R	R
12	0.0	738.4	124	1.0	.120	0.0	I	R	R	R
13	0.0	23.7	2696	1038.6	.025	3.4	0.0	.18	20.1	7.7
14	0.0	8.2	2319	742.8	.055	6.8	0.0	.07	18.6	6.0
15	0.0	6.2	2052	566.9	.035	3.9	0.0	.06	18.5	5.1
16	0.0	6.7	2528	438.8	.060	6.1	0.0	.07	25.0	4.3
17	0.0	7.1	318	632.3	.060	4.0	0.0	.10	4.7	9.4
18	0.0	4.5	215	177.0	0.000	0.0	0.0	.14	6.5	5.3
19	0.0	19.6	1144	109.6	.065	1.6	0.0	.81	47.5	4.5
20	0.0	5.8	787	65.8	0.000	0.0	0.0	.53	71.9	6.0
21	0.0	1.9	501	39.2	0.000	0.0	0.0	.71	190.5	14.9
22	0.0	214.0	176	1.3	.080	0.0	I	R	R	R
23	0.0	546.4	117	1.0	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	5.593	GRAM/BHP HR
	CO	25.216	GRAM/BHP HR
	NO2	6.197	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.678	LB/BHP HR

TABLE G-65. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-0P TEST 128 RUN-1 O-CAT EGR 10 10-25-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.5	4.7	21.3	0	780	.070	10.10	53
2	1200	6.6	2	17.0	11.3	22.9	0	109	.010	9.55	47
3	1200	23.6	5	15.6	12.1	21.8	0	96	.010	9.66	89
4	1200	53.8	12	13.8	14.8	21.0	0	65	.010	10.10	200
5	1200	73.5	17	12.5	15.4	20.9	0	65	.010	10.33	320
6	1200	147.0	34	8.9	22.2	16.5	0	126	.060	13.14	530
7	1200	219.0	50	4.0	28.4	15.5	0	299	.200	13.73	550
8	1200	241.0	55	3.0	29.8	15.6	0	296	.180	13.73	910
9	1200	270.0	62	1.9	32.2	15.7	0	330	.140	13.58	1575
10	1200	294.0	67	1.5	34.2	15.9	0	352	.140	13.43	2050
11	525	0.0	0	16.6	4.5	22.2	0	735	.060	9.55	34
12	1200	0.0	0	22.4	4.8	20.5	0	1398	.010	10.44	11
13	2300	307.0	134	.6	68.0	15.0	0	22	.150	14.33	1575
14	2300	282.0	123	2.2	65.8	14.6	0	18	.270	14.40	1100
15	2300	252.0	110	3.6	59.7	14.7	0	3	.210	14.49	875
16	2300	230.0	101	4.8	57.0	14.6	0	3	.200	14.49	600
17	2300	154.0	67	9.0	44.3	15.1	0	3	.030	14.33	350
18	2300	76.0	33	12.4	30.8	18.0	0	3	.010	12.05	270
19	2300	55.0	24	13.8	27.2	18.7	0	3	.010	11.79	205
20	2300	24.0	11	17.4	21.0	20.7	0	3	.010	10.56	225
21	2300	6.7	3	19.2	17.4	22.1	0	3	.010	9.99	175
22	525	0.0	0	16.8	4.9	19.5	0	337	.060	11.04	50
23	2300	0.0	0	25.0	5.3	24.9	0	1890	.010	8.62	25

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	16.2	29	3.7	.070	0.0	I	R	R	R
2	0.0	5.8	11	8.4	.060	.1	0.0	3.87	7.2	5.5
3	0.0	5.4	11	16.8	.060	.3	0.0	1.01	2.1	3.1
4	0.0	4.3	13	44.1	.050	.6	0.0	.35	1.1	3.6
5	0.0	4.4	14	71.7	.030	.5	0.0	.26	.8	4.3
6	0.0	9.6	92	134.1	.060	2.0	0.0	.29	2.8	4.0
7	0.0	27.6	373	168.5	0.000	0.0	0.0	.55	7.5	3.4
8	0.0	28.7	353	293.0	.040	2.2	0.0	.52	6.4	5.3
9	0.0	35.1	300	555.3	0.000	0.0	0.0	.57	4.9	9.0
10	0.0	40.2	322	776.0	0.000	0.0	0.0	.60	4.8	11.6
11	0.0	15.5	26	2.4	.070	0.0	I	R	R	R
12	0.0	28.7	4	.8	.120	0.0	I	R	R	R
13	0.0	4.6	645	1113.7	.025	3.4	0.0	.03	4.8	8.3
14	0.0	3.7	1110	742.9	.055	6.8	0.0	.03	9.0	6.0
15	0.0	.6	781	535.1	.035	3.9	0.0	.01	7.1	4.8
16	0.0	.6	711	350.6	.060	6.0	0.0	.01	7.1	3.5
17	0.0	.5	85	162.6	.060	4.0	0.0	.01	1.3	2.4
18	0.0	.4	23	103.8	0.000	0.0	0.0	.01	.7	3.1
19	0.0	.3	21	71.2	.065	1.6	0.0	.01	.9	3.0
20	0.0	.3	18	67.3	0.000	0.0	0.0	.03	1.7	6.4
21	0.0	.3	16	45.9	0.000	0.0	0.0	.09	5.4	15.6
22	0.0	6.7	24	3.3	.080	0.0	I	R	R	R
23	0.0	51.5	6	2.3	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.397	GRAM/BHP HR
	CO	5.802	GRAM/BHP HR
	NO2	4.754	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.710	LB/BHP HR

TABLE G-66. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-OP TEST 128 RUN-2 O-CAT EGR 10 10-25-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.8	4.6	20.6	0	522	.080	10.56	26
2	1200	7.0	2	17.4	10.9	22.9	0	69	.010	9.55	55
3	1200	24.0	5	16.2	12.2	22.3	0	61	.010	9.66	79
4	1200	51.0	12	14.4	14.0	21.6	0	48	.010	9.99	160
5	1200	74.0	17	13.2	15.5	21.4	0	55	.010	10.33	370
6	1200	147.0	34	8.9	22.3	16.7	0	106	.050	12.72	480
7	1200	221.0	50	4.0	29.2	15.5	0	294	.240	13.58	550
8	1200	243.0	56	3.0	30.4	15.7	0	295	.160	13.43	910
9	1200	270.0	62	1.9	32.3	15.8	0	311	.130	13.43	1613
10	1200	294.0	67	.2	33.9	16.0	0	352	.150	13.29	1900
11	525	0.0	0	16.9	4.8	20.0	0	427	.050	10.80	31
12	1200	0.0	0	22.5	5.0	20.5	0	1398	.010	10.44	11
13	2300	307.0	134	.6	68.4	14.9	0	15	.120	14.49	1625
14	2300	282.0	123	2.2	65.0	14.6	0	15	.280	14.65	863
15	2300	252.0	110	3.6	59.2	14.7	0	3	.190	14.65	825
16	2300	226.0	99	5.0	55.3	14.6	0	3	.200	14.81	534
17	2300	154.0	67	8.8	44.5	14.9	0	3	.070	14.65	275
18	2300	76.0	33	12.4	30.4	17.6	0	3	.010	12.31	260
19	2300	55.0	24	13.8	27.4	18.2	0	3	.010	11.92	200
20	2300	24.0	11	17.8	20.3	20.2	0	3	.010	10.80	280
21	2300	7.0	3	19.2	18.0	21.2	0	3	.010	10.33	195
22	525	0.0	0	16.9	5.2	18.8	0	429	.070	11.53	60
23	2300	0.0	0	25.0	5.5	25.0	0	2049	.030	8.42	30

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	10.2	32	1.7	.070	0.0	I	R	R	R
2	0.0	3.5	10	9.4	.060	.1	0.0	2.22	6.5	5.9
3	0.0	3.5	12	15.0	.060	.3	0.0	.64	2.1	2.7
4	0.0	3.1	13	33.7	.050	.6	0.0	.26	1.1	2.9
5	0.0	3.7	14	83.5	.030	.5	0.0	.22	.8	4.9
6	0.0	8.4	80	126.1	.060	2.0	0.0	.25	2.4	3.8
7	0.0	28.2	464	174.6	0.000	0.0	0.0	.56	9.2	3.5
8	0.0	29.9	327	305.9	.040	2.2	0.0	.54	5.9	5.5
9	0.0	33.5	283	577.3	0.000	0.0	0.0	.54	4.6	9.4
10	0.0	40.2	346	719.8	0.000	0.0	0.0	.60	5.1	10.7
11	0.0	8.5	20	2.1	.070	0.0	I	R	R	R
12	0.0	29.9	4	.8	.120	0.0	I	R	R	R
13	0.0	3.1	515	1145.6	.025	3.4	0.0	.02	3.8	8.5
14	0.0	2.9	1117	565.8	.055	6.8	0.0	.02	9.0	4.6
15	0.0	.6	694	495.6	.035	3.9	0.0	.01	6.3	4.5
16	0.0	.6	675	296.3	.060	5.9	0.0	.01	6.8	3.0
17	0.0	.5	194	125.2	.060	4.0	0.0	.01	2.9	1.9
18	0.0	.4	23	96.6	0.000	0.0	0.0	.01	.7	2.9
19	0.0	.3	21	69.2	.065	1.6	0.0	.01	.9	2.9
20	0.0	.3	17	79.2	0.000	0.0	0.0	.03	1.6	7.5
21	0.0	.3	16	51.1	0.000	0.0	0.0	.08	5.2	16.7
22	0.0	8.7	29	4.0	.080	0.0	I	R	R	R
23	0.0	59.0	17	2.9	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.379	GRAM/BHP HR
	CO	5.743	GRAM/BHP HR
	NO2	4.253	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.710	LB/BHP HR

TABLE G-67. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 7-1 TEST 125 RUN-1 R+D CAT. 70JETS-60PV 10 23 73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.5	4.4	22.6	0	390	.010	9.23	14
2	1200	5.0	1	18.4	10.8	21.7	0	72	.010	9.88	35
3	1200	24.0	5	17.3	11.3	20.5	0	65	.010	10.21	90
4	1200	54.0	12	16.0	13.2	19.2	0	134	.010	10.92	183
5	1200	74.0	17	15.0	15.1	18.7	0	180	.010	11.41	230
6	1200	147.0	34	10.6	22.0	16.1	0	147	.100	13.43	105
7	1200	221.0	50	5.5	30.5	14.6	0	477	.970	13.88	40
8	1200	240.0	55	4.1	31.1	14.9	0	451	.580	14.03	74
9	1200	270.0	62	1.9	33.4	15.3	0	406	.200	13.88	95
10	1200	293.0	67	.1	34.5	15.8	0	352	.090	13.43	81
11	525	0.0	0	16.6	4.2	21.3	0	238	.020	9.66	7
12	1200	0.0	0	22.3	4.6	32.8	0	774	.010	6.13	2
13	2300	291.0	127	.6	65.0	15.7	0	236	.300	13.73	48
14	2300	268.0	117	2.5	61.5	15.2	0	273	.300	14.03	12
15	2300	238.0	104	4.7	57.0	15.0	0	284	.520	14.03	32
16	2300	218.0	95	6.1	54.5	14.8	0	266	.640	14.03	45
17	2300	146.0	64	11.1	41.5	15.6	0	159	.190	13.73	54
18	2300	72.0	32	16.1	30.0	16.2	0	91	.120	13.29	62
19	2300	53.0	23	17.4	27.2	16.8	0	115	.110	12.86	48
20	2300	24.0	11	19.2	21.5	17.9	0	154	.100	12.05	33
21	2300	6.0	3	20.0	18.4	20.0	0	169	.040	10.92	7
22	525	0.0	0	16.3	5.0	21.0	0	273	.020	9.99	5
23	2300	0.0	0	24.8	4.4	46.3	0	950	.010	4.38	3

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	8.4	4	1.0	.070	0.0	I	R	R	R
2	0.0	3.6	10	5.8	.060	.1	0.0	3.12	8.8	5.0
3	0.0	3.2	10	15.0	.060	.3	0.0	.59	1.8	2.7
4	0.0	7.3	11	33.2	.050	.6	0.0	.60	.9	2.7
5	0.0	10.8	12	45.7	.030	.5	0.0	.64	.7	2.7
6	0.0	10.9	149	25.7	.060	2.0	0.0	.32	4.4	.8
7	0.0	44.3	1820	12.3	0.000	0.0	0.0	.88	36.0	.2
8	0.0	43.4	1128	23.6	.040	2.2	0.0	.79	20.6	.4
4	0.0	43.5	433	33.8	0.000	0.0	0.0	.71	7.0	.5
10	0.0	40.7	210	31.0	0.000	0.0	0.0	.61	3.1	.5
11	0.0	4.7	8	.5	.070	0.0	I	R	R	R
12	0.0	26.0	7	.2	.120	0.0	I	R	R	R
13	0.0	49.5	1271	33.4	.025	3.2	0.0	.39	10.0	.3
14	0.0	53.0	1177	7.7	.055	6.5	0.0	.45	10.0	.1
15	0.0	50.3	1863	18.8	.035	3.6	0.0	.48	17.9	.2
16	0.0	44.7	2175	25.1	.060	5.7	0.0	.47	22.8	.3
17	0.0	21.5	518	24.2	.060	3.8	0.0	.34	8.1	.4
18	0.0	9.2	246	20.9	0.000	0.0	0.0	.29	7.8	.7
19	0.0	11.0	211	15.1	.065	1.5	0.0	.47	9.1	.7
20	0.0	12.3	162	8.8	0.000	0.0	0.0	1.17	15.4	.8
21	0.0	12.8	61	1.8	0.000	0.0	0.0	4.88	23.4	.7
22	0.0	6.2	9	.4	.080	0.0	I	R	R	R
23	0.0	42.3	9	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.703	GRAM/BHP HR
	CO	13.165	GRAM/BHP HR
	NO2	.426	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.710	LB/BHP HR

TABLE G-68. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 7-1 TEST 125 RUN-2 R+O CAT. 70JETS-60PV 10 23 73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	525	0.0	0	16.5	4.6	21.7	0	205	.010	9.77	5
2	1200	5.3	1	18.4	10.7	21.6	0	75	.010	9.99	53
3	1200	24.0	5	17.3	11.7	20.9	0	69	.010	10.33	108
4	1200	53.0	12	16.1	13.4	19.6	0	159	.010	11.04	180
5	1200	75.0	17	15.1	15.0	18.8	0	208	.010	11.41	178
6	1200	147.0	34	10.7	22.2	16.2	0	147	.080	13.29	133
7	1200	219.0	50	5.9	30.1	14.5	0	416	.840	13.88	38
8	1200	240.0	55	4.3	31.3	14.8	0	319	.520	14.03	63
9	1200	269.0	61	2.2	32.5	15.3	0	392	.200	13.73	78
10	1200	294.0	67	.2	33.6	15.9	0	386	.060	13.43	104
11	525	0.0	0	16.8	4.1	21.3	0	170	.010	9.66	9
12	1200	0.0	0	22.3	4.8	33.0	0	766	.010	6.05	4
13	2300	286.0	125	.6	64.7	15.4	0	381	.420	13.43	22
14	2300	267.0	117	2.5	62.0	15.2	0	198	.340	13.58	15
15	2300	238.0	104	5.2	56.5	15.3	0	254	.410	13.43	29
16	2300	218.0	95	6.4	54.4	15.3	0	269	.430	13.58	45
17	2300	146.0	64	11.2	41.4	16.0	0	183	.140	13.29	50
18	2300	72.0	32	16.3	29.4	16.9	0	133	.090	12.59	47
19	2300	53.0	23	17.8	26.2	17.3	0	154	.090	12.18	44
20	2300	24.0	11	19.2	21.6	18.7	0	200	.050	11.16	31
21	2300	5.3	2	20.0	18.3	19.8	0	158	.020	10.56	5
22	525	0.0	0	16.5	4.7	20.0	0	315	.020	9.99	5
23	2300	0.0	0	25.0	5.4	39.8	0	911	.010	4.45	2

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	4.4	4	.4	.070	0.0	I	R	R	R
2	0.0	3.7	10	8.5	.060	.1	0.0	3.02	8.1	7.0
3	0.0	3.5	10	18.4	.060	.3	0.0	.65	1.9	3.4
4	0.0	8.7	11	32.8	.050	.6	0.0	.72	.9	2.7
5	0.0	12.4	12	35.1	.030	.5	0.0	.72	.7	2.1
6	0.0	11.1	122	33.2	.060	2.0	0.0	.33	3.6	1.0
7	0.0	38.5	1569	11.7	0.000	0.0	0.0	.77	31.4	.2
8	0.0	31.0	1023	20.4	.040	2.2	0.0	.57	18.7	.4
9	0.0	41.3	426	27.3	0.000	0.0	0.0	.67	6.9	.4
10	0.0	43.5	137	38.9	0.000	0.0	0.0	.65	2.0	.6
11	0.0	3.3	4	.6	.070	0.0	I	R	R	R
12	0.0	27.2	7	.5	.120	0.0	I	R	R	R
13	0.0	80.6	1793	15.4	.025	3.1	0.0	.64	14.3	.1
14	0.0	39.9	1386	10.0	.055	6.4	0.0	.34	11.9	.1
15	0.0	46.4	1531	17.8	.035	3.6	0.0	.45	14.7	.2
16	0.0	47.3	1527	26.3	.060	5.7	0.0	.50	16.0	.3
17	0.0	25.6	395	23.2	.060	3.8	0.0	.40	6.2	.4
18	0.0	14.0	191	16.4	0.000	0.0	0.0	.44	6.1	.5
19	0.0	14.9	176	14.1	.065	1.5	0.0	.64	7.6	.6
20	0.0	17.4	88	9.0	0.000	0.0	0.0	1.66	8.4	.9
21	0.0	12.4	32	1.3	0.000	0.0	0.0	5.34	13.6	.6
22	0.0	6.7	9	.4	.080	0.0	I	R	R	R
23	0.0	49.0	11	.4	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.720	GRAM/BHP HR
	CO	11.810	GRAM/BHP HR
	NO2	.424	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.713	LB/BHP HR

TABLE G-69. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 7-1 TEST 125 RUN-3 R+O CAT. 70JETS-60PV 10 3 73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO_2	NO
1	525	0.0	0	16.8	4.4	22.5	0	251	.010	9.44	4
2	1200	5.2	1	18.4	10.4	21.1	0	72	.010	9.99	47
3	1200	24.0	5	17.4	11.4	20.4	0	69	.010	10.33	90
4	1200	53.0	12	16.1	13.3	19.1	0	138	.010	11.04	178
5	1200	74.0	17	15.1	14.9	18.6	0	187	.010	11.53	290
6	1200	147.0	34	10.4	22.2	15.9	0	172	.100	13.43	120
7	1200	219.0	50	5.9	29.8	14.6	0	356	.770	14.03	42
8	1200	240.0	55	4.3	30.9	14.8	0	404	.480	14.18	65
9	1200	270.0	62	2.1	33.0	15.3	0	389	.180	13.88	85
10	1200	295.0	67	.2	34.5	15.6	0	360	.080	13.73	128
11	525	0.0	0	16.7	3.9	21.4	0	190	.010	9.55	5
12	1200	0.0	0	22.3	4.8	33.8	0	779	.010	6.05	4
13	2300	290.0	127	.6	64.2	15.6	0	354	.260	13.73	35
14	2300	267.0	117	2.8	61.2	15.3	0	297	.370	13.73	15
15	2300	238.0	104	5.2	56.7	15.1	0	297	.450	13.73	28
16	2300	218.0	95	6.4	54.2	15.1	0	283	.480	13.73	44
17	2300	146.0	64	11.2	41.4	15.7	0	169	.150	13.43	53
18	2300	72.0	32	16.2	29.5	16.4	0	127	.090	12.86	50
19	2300	53.0	23	11.7	26.4	16.7	0	140	.090	12.59	44
20	2300	24.0	11	19.2	21.5	17.6	0	139	.070	11.66	28
21	2300	4.0	2	20.0	18.1	19.0	0	165	.020	10.56	6
22	525	0.0	0	16.5	4.7	20.3	0	272	.010	9.55	5
23	2300	0.0	0	25.0	5.2	36.8	0	720	.010	4.65	1

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO_2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO_2
1	0.0	5.3	4	.3	.070	0.0	I	R	R	R
2	0.0	3.4	10	7.4	.060	.1	0.0	2.86	8.0	6.2
3	0.0	3.4	10	14.9	.060	.3	0.0	.63	1.8	2.7
4	0.0	7.5	11	32.2	.050	.6	0.0	.62	.9	2.7
5	0.0	10.9	12	56.3	.030	.5	0.0	.65	.7	3.3
6	0.0	12.8	150	29.6	.060	2.0	0.0	.38	4.5	.9
7	0.0	32.4	1417	12.7	0.000	0.0	0.0	.65	28.3	.3
8	0.0	38.5	924	20.6	.040	2.2	0.0	.70	16.9	.4
9	0.0	41.3	386	30.0	0.000	0.0	0.0	.67	6.3	.5
10	0.0	40.7	183	43.0	0.000	0.0	0.0	.60	2.7	.7
11	0.0	3.5	4	.3	.070	0.0	I	R	R	R
12	0.0	27.6	7	.5	.120	0.0	I	R	R	R
13	0.0	73.4	1090	24.1	.025	3.2	0.0	.58	8.6	.2
14	0.0	58.4	1468	9.8	.055	6.4	0.0	.50	12.6	.1
15	0.0	53.8	1645	16.8	.035	3.6	0.0	.52	15.8	.2
16	0.0	48.8	1674	25.2	.060	5.7	0.0	.51	17.5	.3
17	0.0	23.3	418	24.3	.060	3.8	0.0	.36	6.5	.4
18	0.0	13.1	188	17.1	0.000	0.0	0.0	.41	6.0	.5
19	0.0	13.2	172	13.8	.065	1.5	0.0	.57	7.4	.6
20	0.0	11.5	117	7.7	0.000	0.0	0.0	1.09	11.2	.7
21	0.0	12.8	31	1.5	0.000	0.0	0.0	7.28	17.9	.9
22	0.0	6.1	4	.4	.080	0.0	I	R	R	R
23	0.0	38.3	10	.2	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	.741	GRAM/BHP HR
	CO	11.740	GRAM/BHP HR
	NO_2	.432	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.707	LB/BHP HR

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                    TABLE  G-70.             VEHICLE EMISSION RESULTS

UNIT NO.  7-1        TEST NO. 1           DATE 11/ 5/73                   MFGR. CODE   7                  YR.  1973
VEHICLE MODEL                             ENGINE   7-1                    CURB WT.     -0                 GVW  45,000
                                                                          LA-4 Dyno Test Weight  25,000

BAROMETER  29.38 IN.HG.                                                 WET BULB TEMP 62.0 DEG. F
DRY BULB TEMP.  70.0 DEG. F                                              SP. HUMIDITY  71.0 GRAINS/LB
REL. HUMIDITY     64 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                       1                2
     FINAL WT.,   GRAMS                         -0.00            -0.00
     INITIAL WT., GRAMS                         -0.00            -0.00
     DIFFERENCE   GRAMS                          0.00             0.00

     TOTAL EVAPORATIVE EMISSIONS                                                 0.00 GRAMS

EXHAUST EMISSIONS

     BLOWER DIF. PRESS., G2,  13.0 IN. H2O                              BLOWER INLET PRESS., G1   2.6 IN. H2O
                                                                         BLOWER INLET TEMP.  125 DEG. F
     BAG RESULTS
     BAG NO.                                          1                2                3
     BLOWER REVOLUTIONS                            4871            16593             4897
     HC    SAMPLE  METER READING/SCALE            9.8/3           10.8/3           10.3/3
     HC    SAMPLE  PPM                               98              108              103
     HC    BACKGRD METER READING/SCALE            2.8/3            2.5/3            2.7/3
     HC    BACKGRD PPM                               28               25               27
     CO    SAMPLE  METER READING/SCALE           27.1/2           24.3/2           26.4/2
     CO    SAMPLE  PPM                              849              752              842
     CO    BACKGRD METER READING/SCALE            3.3/2            2.8/2            1.4/2
     CO    BACKGRD PPM                               94               80               40
     CO2   SAMPLE  METER READING/SCALE           56.8/2           45.2/2           65.2/2
     CO2   SAMPLE  PERCENT                         1.63             1.26             1.92
     CO2   BACKGRD METER READING/SCALE            3.7/2            3.5/2            3.4/2
     CO2   BACKGRD PERCENT                          .09              .08              .09
     NOX   SAMPLE  METER READING/SCALE            1.1/3            1.2/3            1.2/3
     NOX   SAMPLE  PPM                              3.3              3.6              5.1
     NOX   BACKGRD METER READING/SCALE             .7/3             .5/3             .4/3
     NOX   BACKGRD PPM                              2.1              1.5              1.2

     HC    CONCENTRATION PPM                         74               86               80
     CO    CONCENTRATION PPM                        724              648              760
     CO2   CONCENTRATION PCT                       1.55             1.18             1.85
     NOX   CONCENTRATION PPM                        1.5              2.3              4.1
     HC    MASS GRAMS                              6.38            12.45             6.95
     CO    MASS GRAMS                            126.21           190.67           133.37
     CO2   MASS GRAMS                           4288.80          5480.34          5116.88
     NOX   MASS GRAMS                               .41             1.07             1.15

     WEIGHTED MASS HC        2.55 GRAMS/MILE
     WEIGHTED MASS CO       42.82 GRAMS/MILE
     WEIGHTED MASS CO2    1365.49 GRAMS/MILE
     WEIGHTED MASS NOX        .25 GRAMS/MILE
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                    TABLE G-71.          VEHICLE EMISSION RESULTS

UNIT NO.  7-1        TEST NO. 2         DATE 11/ 6/73              MFGR. CODE   7                  YR.  [illegible]
VEHICLE MODEL                           ENGINE    7-1              CURB WT.     -0                 GVW  45,000
                                                                   LA-4 Dyno Test Weight  25,000

BAROMETER  29.43 IN.HG.                                          WET BULB TEMP 61.0 DEG. F
DRY BULB TEMP.  69.0 DEG. F                                       SP. HUMIDITY  67.9 GRAINS/LB
REL. HUMIDITY      63 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                         1                2
     FINAL WT.,   GRAMS                            -0.00            -0.00
     INITIAL WT., GRAMS                            -0.00            -0.00
     DIFFERENCE   GRAMS                             0.00             0.00

     TOTAL EVAPORATIVE EMISSIONS                                              0.00 GRAMS


EXHAUST EMISSIONS

                                                                 BLOWER INLET PRESS., G1   2.5 IN. H2O
     BLOWER DIF. PRESS., G2,  13.5 IN. H2O                       BLOWER INLET TEMP.  120 DEG. F

     BAG RESULTS
     BAG NO.                                          1               2               3
     BLOWER REVOLUTIONS                            10988           16990            9969
     HC    SAMPLE  METER READING/SCALE             13.3/3           8.8/3          11.4/3
     HC    SAMPLE  PPM                              134              88             114
     HC    BACKGRD METER READING/SCALE              1.7/3           2.9/3           1.9/3
     HC    BACKGRD PPM                               17              29              19
     CO    SAMPLE  METER READING/SCALE             47.1/2          25.4/2          31.8/2
     CO    SAMPLE  PPM                             1609             790            1016
     CO    BACKGRD METER READING/SCALE              2.6/2           4.6/2           2.3/2
     CO    BACKGRD PPM                               24             132              65
     CO2   SAMPLE  METER READING/SCALE             58.2/2          40.8/2          54.2/2
     CO2   SAMPLE  PERCENT                         1.68            1.12            1.64
     CO2   BACKGRD METER READING/SCALE              3.7/2           5.3/2           4.6/2
     CO2   BACKGRD PERCENT                          .09             .13             .12
     NOX   SAMPLE  METER READING/SCALE              2.2/3           1.2/3           3.7/3
     NOX   SAMPLE  PPM                              6.6             3.6             8.1
     NOX   BACKGRD METER READING/SCALE              .5/3            .5/3            .5/3
     NOX   BACKGRD PPM                              1.5             1.5             1.5

     HC    CONCENTRATION PPM                        128              62              98
     CO    CONCENTRATION PPM                       1561             739             907
     CO2   CONCENTRATION PCT                       1.60            1.00            1.58
     NOX   CONCENTRATION PPM                        5.3             2.2             6.8
     HC    MASS GRAMS                             16.55            8.94            8.61
     CO    MASS GRAMS                            273.80          188.39          161.59
     CO2   MASS GRAMS                           4734.44         3662.20         4445.05
     NOX   MASS GRAMS                              1.58            1.06            1.93

     WEIGHTED MASS HC       2.80 GRAMS/MILE
     WEIGHTED MASS CO      53.09 GRAMS/MILE
     WEIGHTED MASS CO2   1230.89 GRAMS/MILE
     WEIGHTED MASS NOX      .38 GRAMS/MILE
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                    TABLE G-72.            VEHICLE EMISSION RESULTS

UNIT NO.  240        TEST NO. 3          DATE 11/ 2/73                  MFGR. CODE   7                     YR.  1971
VEHICLE MODEL                            ENGINE   7-0                   CURB WT.    -0                     GVW  45,000
                                                                        LA-4 Dyno Test Weight  25,000

BAROMETER  29.24 IN.HG.                                               WET BULB TEMP 66.0 DEG. F
DRY BULB TEMP.  70.0 DEG. F                                            SP. HUMIDITY  91.0 GRAINS/LB
REL. HUMIDITY     81 PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                     1               2
     FINAL WT.,    GRAMS                       -0.00           -0.00
     INITIAL WT., GRAMS                        -0.00           -0.00
     DIFFERENCE    GRAMS                        0.00            0.00

     TOTAL EVAPORATIVE EMISSIONS                                             0.00 GRAMS

EXHAUST EMISSIONS

                                                                      BLOWER INLET PRESS., G1   7.6 IN. H2O
     BLOWER DIF. PRESS., G2,  13.5 IN. H2O                            BLOWER INLET TEMP.  120 DEG. F

     BAG RESULTS
     BAG NO.                                      1               2               3
     BLOWER REVOLUTIONS                       10299           15599            9699
     HC   SAMPLE  METER READING/SCALE          67.3/3          39.4/3          48.2/3
     HC   SAMPLE  PPM                          673             394             482
     HC   BACKGRD METER READING/SCALE           3.1/3           3.6/3           3.3/3
     HC   BACKGRD PPM                           31              36              33
     CO   SAMPLE  METER READING/SCALE          88.0/2          66.5/2          87.9/2
     CO   SAMPLE  PPM                         3598            2661            3682
     CO   BACKGRD METER READING/SCALE            .8/2           2.0/2           1.6/2
     CO   BACKGRD PPM                           23              57              45
     CO2  SAMPLE  METER READING/SCALE          66.3/2          38.7/2          75.7/2
     CO2  SAMPLE  PERCENT                      2.03            1.06            2.30
     CO2  BACKGRD METER READING/SCALE           2.2/2           3.2/2           2.9/2
     CO2  BACKGRD PERCENT                       .05             .08             .07
     NOX  SAMPLE  METER READING/SCALE          38.7/3          18.8/3          56.1/3
     NOX  SAMPLE  PPM                         116.1            56.4           168.3
     NOX  BACKGRD METER READING/SCALE            .1/3            .4/3            .4/3
     NOX  BACKGRD PPM                            .3             1.2             1.2

     HC   CONCENTRATION PPM                    648             362             456
     CO   CONCENTRATION PPM                   3429            2459            3387
     CO2  CONCENTRATION PCT                   1.98             .99            2.24
     NOX  CONCENTRATION PPM                  115.9            55.3           167.3
     HC   MASS GRAMS                         61.61           52.70           38.91
     CO   MASS GRAMS                        658.60          726.33          583.99
     CO2  MASS GRAMS                       6017.18         4587.57         6097.68
     NOX  MASS GRAMS                         34.53           28.91           51.25

     WEIGHTED MASS HC      14.52 GRAMS/MILE
     WEIGHTED MASS CO     174.98 GRAMS/MILE
     WEIGHTED MASS CO2   1420.09 GRAMS/MILE
     WEIGHTED MASS NOX     10.02 GRAMS/MILE
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TABLE G-73. VEHICLE EMISSION RESULTS

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UNIT NO.  780          TEST NO. 4          DATE 11/ 8/73                 MFGR. CODE  7                  YR.  1971
VEHICLE MODEL                              ENGINE   7-0                  CURB WT.    -0                 GVW  45,000
                                                                         LA-4 Dyno Test Weight  25,000

BAROMETER  29.47 IN.HG.                                                WET BULB TEMP 74.0 DEG. F
DRY BULB TEMP.  77.0 DEG. F                                             SP. HUMIDITY 115.6 GRAINS/LB
REL. HUMIDITY     [illegible] PCT.

EVAPORATIVE EMISSIONS

     CANISTER                                        1                2
     FINAL WT.,   GRAMS                          -0.00            -0.00
     INITIAL WT., GRAMS                          -0.00            -0.00
     DIFFERENCE   GRAMS                           0.00             0.00

     TOTAL EVAPORATIVE EMISSIONS                                            0.00 GRAMS

EXHAUST EMISSIONS

                                                                       BLOWER INLET PRESS., G1   2.5 IN. H2O
     BLOWER DIF. PRESS., G2,  13.5 IN. H2O                             BLOWER INLET TEMP.  130 DEG. F

     BAG RESULTS
     BAG NO.                                         1                 2                 3
     BLOWER REVOLUTIONS                          10501             16669              9692
     HC   SAMPLE  METER READING/SCALE           71.6/3            47.9/3            44.6/3
     HC   SAMPLE  PPM                             716               479               446
     HC   BCKGRD  METER READING/SCALE            3.2/3             3.1/3             3.4/3
     HC   BCKGRD  PPM                              32                31                34
     CO   SAMPLE  METER READING/SCALE           83.4/2            70.4/2            84.4/2
     CO   SAMPLE  PPM                            3908              2688              4226
     CO   BCKGRD  METER READING/SCALE             .4/2              .6/2             2.1/2
     CO   BCKGRD  PPM                              11                17                57
     CO2  SAMPLE  METER READING/SCALE           69.2/2            50.2/2            73.3/2
     CO2  SAMPLE  PERCENT                        1.88              1.10              2.21
     CO2  BCKGRD  METER READING/SCALE            2.1/2             1.9/2             1.1/2
     CO2  BCKGRD  PERCENT                         .05               .05               .03
     NOX  SAMPLE  METER READING/SCALE           37.1/3            18.7/3            54.4/3
     NOX  SAMPLE  PPM                           111.3              56.1             163.2
     NOX  BCKGRD  METER READING/SCALE             .3/3              .1/3              .9/3
     NOX  BCKGRD  PPM                              .9                .3               2.7

     HC   CONCENTRATION PPM                       689               451               459
     CO   CONCENTRATION PPM                      3184              2544              4470
     CO2  CONCENTRATION PCT                      1.84              1.06              2.19
     NOX  CONCENTRATION PPM                     110.6              55.8             161.0
     HC   MASS GRAMS                            63.96             51.38             34.24
     CO   MASS GRAMS                           596.42            251.39            699.26
     CO2  MASS GRAMS                          5996.19           4959.83           5964.47
     NOX  MASS GRAMS                            42.04             33.48             56.46

     WEIGHTED MASS HC      14.50 GRAMS/MILE
     WEIGHTED MASS CO     179.92 GRAMS/MILE
     WEIGHTED MASS CO2   1924.19 GRAMS/MILE
     WEIGHTED MASS NOX    11.16 GRAMS/MILE
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APPENDIX H

TASK 8 - ENGINE 8

MASS EMISSIONS RESULTS BY:
NINE-MODE FTP
NINE-MODE EPA
AND 23-MODE PROCEDURES

TABLE H-1. COMPOSITE EMISSIONS FOR ENGINE 8-0

NINE-MODE FTP

				Composite Emissions, Gram/Bhp Hr					
				HC		CO	NO_2		Cycle BSFC
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp Hr
48	1	7-9	8-0	3.51	4.87	75.4	9.61	9.24	0.778
48	2	7-9	8-0	4.04	5.49	73.2	10.65	9.54	0.778
48	3	7-9	8-0	3.47	5.00	71.1	10.25	10.14	0.778
		AVERAGE		3.67	5.12	73.2	10.17	9.64	0.778
NINE-MODE EPA									
49	1	7-9	8-0	3.28	4.06	51.7	10.27	10.07	0.674
49	2	7-9	8-0	2.39	3.68	55.0	10.01	9.81	0.674
49	3	7-9	8-0	2.47	3.90	49.4	9.92	9.70	0.674
		AVERAGE		2.71	3.88	52.0	10.07	9.86	0.674
23-MODE EPA									
50	1	7-10	8-0	----	6.49	88.4	----	9.31	0.673
50	2	7-10	8-0	----	6.56	86.1	----	9.81	0.671
50	3	7-10	8-0	----	6.51	79.8	----	9.52	0.671
		AVERAGE			6.52	84.8		9.55	0.672

* Engine 8-0 - 1972 and 1973 Standard Federal Configuration - Engine not offered for sale in California in 1973.

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                    TABLE H-2. MASS EMISSIONS BY NINE-MODE FTP
ENGINE B-0   TEST-48  RUN-1   1973 STANDARD ENGINE  07-09-73     K =1.106     HUM =126.7  GR/LB
------------------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE           HC      CO     CO2     NO    CARBON    CONS.      HC      CO     NO2   FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE        293   3.130  10.52      76    13.966     2586      59    1171       5   .232    13.6      272     1.1     0   15.8
2 16 MG        87   1.810  14.00     535    15.904    12792      76    2991     143   .077     5.8      226    11.0    28   16.0
3 10 MG        42    .550  14.44    1619    15.035    19192      58    1919     682   .147     8.5      208   100.3    68   10.0
4 16 MG        45   1.180  14.32     561    15.549    12792      40    1961     153   .077     3.1      151    11.8    28   16.0
5 19 MG        50   2.020  13.83     194    15.904     9299      32    2386      38   .057     1.8      136     2.1     7   19.0
6 16 MG        44   1.690  14.25     547    15.988    12792      38    2731     145   .077     2.9      210    11.2    28   16.0
7  3 MG        60   2.470  13.81    2013    16.345    28939     115    8834    1183   .113    13.0      998   133.7   120    3.0
8 16 MG        38   1.230  14.39     513    15.661    12792      34    2029     139   .077     2.6      156    10.7    28   16.0
9 C.T.       2510   2.570   8.12      73    13.901     2449     495     949       4   .143    70.8      136      .6     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   3.7       76     8.7
1 IDLE        293   3.130  10.52      76    13.966     2586      59    1171       5   .232    13.6      272     1.1     0   15.8
2 16 MG        98   2.000  13.79     603    15.896    12792      85    3081     161   .077     6.6      250    12.4    28   16.0
3 10 MG        38    .560  14.58    1597    15.181    19192      52    1926     669   .147     7.6      210    98.3    68   10.0
4 16 MG        47   1.400  14.25     549    15.701    12792      41    2304     149   .077     3.2      177    11.4    28   16.0
5 19 MG        55   2.190  13.76     195    16.009     9299      38    2570      38   .057     2.0      146     2.1     7   19.0
6 16 MG        47   2.010  14.01     554    16.071    12792      40    3232     146   .077     3.1      249    11.3    28   16.0
7  3 MG        60   2.640  13.60    1958    16.305    28939     115    9465    1159   .113    13.0     1070   130.9   120    3.0
8 16 MG        41   1.390  13.83     491    15.264    12792      37    2353     137   .077     2.9      181    10.5    28   16.0
9 C.T.       2493   2.610   8.33      63    13.568     2449     474     982       4   .143    67.8      136      .5     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   3.7       83     8.5
1 IDLE        273   3.040  11.36      73    14.695     2586      52    1081       4   .232    12.0      251     1.0     0   15.8
2 16 MG        57   1.950  13.99     541    16.002    12792      49    3199     144   .077     3.8      242    11.1    28   16.0
3 10 MG        31    .490  14.52    1659    15.043    19192      43    1259     699   .147     6.3      185   102.7    68   70.0
4 16 MG        40   1.230  14.42     536    15.693    12792      35    2025     145   .077     2.7      156    11.2    28   16.0
5 19 MG        51   2.230  13.79     194    16.025     9299      32    2619      37   .057     1.8      149     2.1     7   19.0
6 16 MG        41   1.300  14.36     535    15.704    12792      36    2139     145   .077     2.8      165    11.1    28   16.0
7  3 MG        57   2.580  13.70    1946    16.342    28939     109    9229    1144   .113    12.3     1043   129.3   120    3.0
8 16 MG        37   1.310  14.00     586    15.350    12792      33    2205     184   .077     2.6      170    11.8    28   16.0
9 C.T.       2306   2.950   8.98      65    13.920     2449     459     903       4   .143    65.0      129      .6     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   3.4       76     8.6
1 IDLE        273   3.040  11.36      73    14.695     2586      52    1081       4   .232    12.0      251     1.0     0   15.8
2 16 MG        66   1.910  14.16     583    15.691    12792      58    2329     142   .077     4.5      179    10.9    28   16.0
3 10 MG        33    .930  14.62    1676    15.086    19192      45    1102     706   .147     6.6      162   103.8    68   10.0
4 16 MG        42   1.430  14.29     982    15.765    12792      37    2344     130   .077     2.8      180    10.0    28   16.0
5 19 MG        50   2.340  13.71     199    16.104     9299      31    2729      37   .057     1.8      156     2.1     7   19.0
6 16 MG        41   1.200  14.36     871    15.604    12792      36    1987     155   .077     2.8      153    12.0    28   16.0
7  3 MG        58   2.170  13.80    2021    16.033    28939     113    7912    1211   .113    12.8      894   136.9   120    3.0
8 16 MG        39   1.300  14.31     512    15.652    12792      34    2146     139   .077     2.7      165    10.7    28   16.0
9 C.T.       2399   2.630   8.37      93    13.886     2449     466     958       6   .143    66.6      137      .8     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   3.5       70     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------   3.7       80     8.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------   3.4       73     8.7
FOUR CYCLE COMPOSITE -                      HC- NDIR 0.35(     3.7) + 0.65(     3.4) =     3.511    GM/BHP HR
                                            CO- NDIR 0.35(    79.5) + 0.65(    73.1) =    75.366    GM/BHP HR
                                            NO2-NDIR 0.35(     8.6) + 0.65(     8.7) =     8.683    GM/BHP HR
                                                                 CORRECTED NO2 =     9.606    GM/BHP HR
                                                                          BSFC =      .778    LB/BHP HR
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              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR            MAN.
MODE          HC-FID   CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2   FACT.  HC-FID      CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------------------
1 IDLE       5575   3.130  10.52      45    14.207     2586     101    1151       3   .232    23.5      267      .6     0   15.8
2 16 MG      1605   1.810  14.00     500    15.970    12792     129    2929     133   .077     9.9      225    10.2    28   16.0
3 10 MG       927    .550  14.44    1550    15.033    19192      54    1915     655   .147     8.0      208    96.3    68   10.0
4 16 MG       775   1.180  14.32     537    15.578    12792      64    1957     146   .077     4.9      151    11.3    28   16.0
5 19 MG      1190   2.020  13.83     187    15.969     9299      69    2376      36   .057     4.0      135     2.1     7   19.0
6 16 MG       761   1.690  14.25     525    16.016    12792      61    2727     139   .077     4.7      210    10.7    28   16.0
7  3 MG      1582   2.470  13.81    1937    16.938    28939     279    8784    1132   .113    31.5      993   127.9   120    3.0
8 16 MG       858   1.230  14.39     500    15.706    12792      70    2024     135   .077     5.4      156    10.4    28   16.0
9 C.T.      30769   2.570   8.12      37    13.767     2449     547     924       2   .143    78.3      132      .3     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   5.2       76     8.3
1 IDLE       5575   3.130  10.52      45    14.207     2586     101    1151       3   .232    23.5      267      .6     0   15.8
2 16 MG      1948   2.000  13.79     575    15.985    12792     156    3233     153   .077    12.0      249    11.8    28   16.0
3 10 MG       456    .560  14.58    1575    15.186    19192      57    1926     659   .147     8.4      210    96.9    68   10.0
4 16 MG       844   1.400  14.25     537    15.734    12792      69    2299     145   .077     5.3      177    11.2    28   16.0
5 19 MG      1906   2.190  13.76     187    16.091     9299      81    2557      36   .057     4.6      146     2.0     7   19.0
6 16 MG       832   2.010  14.01     525    16.103    12792      66    3225     138   .077     5.1      248    10.7    28   16.0
7  3 MG      1639   2.640  13.60    1985    16.904    28939     289    9408    1127   .113    32.7     1063   127.9   120    3.0
8 16 MG       770   1.390  13.83     475    15.297    12792      64    2348     132   .077     5.0      181    10.2    28   16.0
9 C.T.      22029   2.610   8.33      25    13.192     2449     410     982       2   .143    58.7      140      .2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   4.8       82     8.3
1 IDLE       5836   3.040  11.36      50    14.484     2586     101    1060       3   .232    23.4      246      .7     0   15.8
2 16 MG      1664   1.950  13.99     505    16.106    12792     132    3128     133   .077    10.2      241    10.3    28   16.0
3 10 MG       998    .490  14.52    1612    15.060    19192      63    1258     680   .147     9.3      185   100.0    68   70.0
4 16 MG       887   1.230  14.42     525    15.739    12792      72    2019     142   .077     5.6      155    10.9    28   16.0
5 19 MG      1992   2.230  13.79     187    16.119     9299      86    2599      36   .057     4.9      148     2.0     7   19.0
6 16 MG       916   1.300  14.36     525    15.752    12792      74    2133     142   .077     5.7      164    10.9    28   16.0
7  3 MG      1726   2.580  13.70    1950    16.453    28939     304    9167    1139   .113    34.3     1036   128.7   120    3.0
8 16 MG       828   1.310  14.00     525    15.393    12792      69    2199     145   .077     5.3      169    11.2    28   16.0
9 C.T.      22903   2.950   8.98      62    13.220     2449     424     917       4   .143    60.7      131      .5     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   4.9       76     8.4
1 IDLE       5836   3.040  11.36      50    14.484     2586     101    1060       3   .232    23.4      246      .7     0   15.8
2 16 MG      1716   1.910  14.16     510    15.742    12792     139    2315     138   .077    10.7      178    10.6    28   16.0
3 10 MG       515    .930  14.62    1625    15.101    19192      65    1101     684   .147     9.6      162   100.5    68   10.0
4 16 MG       844   1.430  14.29     475    15.804    12792      68    2338     128   .077     5.3      180     9.8    28   16.0
5 19 MG      1321   2.340  13.71     175    16.182     9299      76    2716      33   .057     4.3      155     1.9     7   19.0
6 16 MG       843   1.200  14.36     550    15.644    12792      69    1982     149   .077     5.3      153    11.5    28   16.0
7  3 MG      1463   2.170  13.80    1875    16.116    28939     263    7871    1118   .113    29.7      889   126.3   120    3.0
8 16 MG       786   1.300  14.31     475    15.689    12792      64    2141     129   .077     4.9      165     9.9    28   16.0
9 C.T.      22916   2.630   8.37      25    13.292     2449     422     979       2   .143    60.4      140      .2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------------   4.7       70     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------------   5.0       79     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------------   4.8       73     8.4
FOUR CYCLE COMPOSITE -                      HC- FID  0.35(     5.0) + 0.65(     4.8) =     4.867    GM/BHP HR
                                            CO- NDIR 0.35(    79.1) + 0.65(    72.8) =    74.987    GM/BHP HR
                                            NO2-CL   0.35(     8.3) + 0.65(     8.4) =     8.353    GM/BHP HR
                                                                 CORRECTED NO2 =     9.241    GM/BHP HR
                                                                          BSFC =      .778    LB/BHP HR
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                          TABLE H-3.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE-8-0   TEST-48  RUN-2   1973 STANDARD ENGINE  07-09-73      H =1.093     HUM =115.6  GR/LB
----------------------------------------------------------------------------------------------------------------
               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR                MAN.
MODE           HC      CO     CO2      NO   CARBON   CONS.     HC     CO    NO2   FACT.    HC     CO    NO2    HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE        541   3.040   10.72     129   14.394    2589    105   1108      8   .232   24.5   257    1.8     0   15.8
2 16 MG        80   1.210   14.18     660   15.476   12792     71   2020    181   .077    5.5   156   13.9    28   16.0
3 10 MG        45    .510   14.28    1820   14.839   19142     63   1329    779   .147    9.2   195  114.6    68   10.0
4 16 MG        46   1.280   14.08     657   15.410   12792     41   2146    181   .077    3.2   165   13.9    28   16.0
5 19 MG        53   1.870   13.78     314   15.707    9294     34   2236     62   .057    1.9   127    3.5     7   19.0
6 16 MG        43   1.040   14.20     741   15.286   12792     39   1758    206   .077    3.0   135   15.9    28   16.0
7  3 MG        60   2.200   13.69    1995   15.955   28939    118   8061   1201   .113   13.3   911  135.8   120    3.0
8 16 MG        40   1.300   14.26     692   15.603   12792     35   2153    188   .077    2.7   166   14.5    28   16.0
9 C.T.       2919   2.870    7.93     165   13.447    2449    573   1056     10   .143   82.0   151    1.4     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    4.5    69    9.7
1 IDLE        541   3.040   10.72     129   14.394    2589    105   1108      8   .232   24.5   257    1.8     0   15.8
2 16 MG        66   1.490   14.06     699   15.621   12792     58   2465    190   .077    4.5   190   14.6    28   16.0
3 10 MG        35    .430   14.52    1891   14.988   19142     48   1109    802   .147    7.1   163  117.9    68   10.0
4 16 MG        43   1.350   14.20     713   15.596   12792     38   2237    194   .077    2.9   172   14.9    28   16.0
5 19 MG        56   2.160   13.69     312   15.910    9294     35   2550     61   .057    2.0   145    3.5     7   19.0
6 16 MG        42   1.200   14.24     712   15.485   12792     37   2002    195   .077    2.9   154   15.0    28   16.0
7  3 MG        56   2.250   13.69    2079   16.000   28939    109   8220   1248   .113   12.4   929  141.1   120    3.0
8 16 MG        39   1.320   14.22     667   15.582   12792     35   2189    182   .077    2.7   169   14.0    28   16.0
9 C.T.       2577   3.100    7.85     167   13.733    2449    496   1117     10   .143   71.0   160    1.4     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    4.0    72    9.9
1 IDLE        480   3.080   11.28     143   14.878    2589     90   1083      8   .232   20.9   251    1.9     0   15.8
2 16 MG        61   1.380   14.08     647   15.526   12792     54   2297    177   .077    4.2   177   13.6    28   16.0
3 10 MG        39    .440   14.48    1828   14.957   19142     47   1138    777   .147    6.9   167  114.2    68   10.0
4 16 MG        39   1.230   14.25     700   15.522   12792     35   2048    192   .077    2.7   158   14.7    28   16.0
5 19 MG        50   2.180   13.77     294   16.004    9294     31   2559     57   .057    1.8   146    3.2     7   19.0
6 16 MG        44   1.760   14.09     745   15.898   12792     38   2861    199   .077    2.9   220   15.3    28   16.0
7  3 MG        60   2.620   13.56    2108   16.245   28939    115   9428   1247   .113   13.0  1065  140.9   120    3.0
8 16 MG        92   1.350   13.97     638   15.414   12792     82   2262    176   .077    6.3   174   13.5    28   16.0
9 C.T.       2955   2.820    8.12     146   13.591    2449    478   1026      9   .143   68.3   147    1.2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    3.9    77    9.8
1 IDLE        480   3.080   11.28     143   14.878    2589     90   1083      8   .232   20.9   251    1.9     0   15.8
2 16 MG        70   1.450   14.03     614   15.556   12792     62   2409    168   .077    4.8   185   12.9    28   16.0
3 10 MG        37    .440   14.44    1837   14.920   19142     51   1140    782   .147    7.5   168  115.0    68   10.0
4 16 MG        43   1.320   14.25     642   15.616   12792     38   2184    175   .077    2.9   168   13.4    28   16.0
5 19 MG        52   2.170   13.70     285   15.926    9294     33   2559     55   .057    1.9   146    3.1     7   19.0
6 16 MG        42   1.230   14.23     653   15.505   12792     37   2050    179   .077    2.9   158   13.8    28   16.0
7  3 MG        60   2.320   13.62    2039   16.005   28939    117   8474   1224   .113   13.2   958  138.3   120    3.0
8 16 MG        40   1.320   14.14     659   15.503   12792     36   2200    179   .077    2.7   169   13.8    28   16.0
9 C.T.       2611   2.890    7.89     142   13.600    2449    508   1051      8   .143   72.6   150    1.2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    4.0    72    9.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------    4.2    71    9.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------    3.9    75    9.7
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     4.2) + 0.65(     3.9) =     4.036   GM/BHP HR
                                       CO- NDIR 0.35(    70.6) + 0.65(    74.5) =    73.155   GM/BHP HR
                                       NO2-NDIR 0.35(     9.8) + 0.65(     9.7) =     9.737   GM/BHP HR
                                                            CORRECTED NO2 =    10.646   GM/BHP HR
                                                                     BSFC =      .779   LB/BHP HR
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               CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR                MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.     HC     CO    NO2   FACT.  HC-FID   CO  NO2-CL   HP   VAC.
----------------------------------------------------------------------------------------------------------------
1 IDLE       7891   3.040   10.72      50   14.549    2589    140   1093      3   .232   32.6   254     .7     0   15.8
2 16 MG      1085   1.210   14.18     530   15.499   12792     90   2017    145   .077    6.9   155   11.2    28   16.0
3 10 MG       540    .510   14.28    1637   14.844   19142     70   1328    701   .147   10.2   195  103.0    68   10.0
4 16 MG       870   1.280   14.08     550   15.447   12792     72   2141    151   .077    5.5   165   11.6    28   16.0
5 19 MG      1374   1.870   13.78     212   15.787    9294     81   2225     41   .057    4.6   127    2.4     7   19.0
6 16 MG       827   1.040   14.20     625   15.323   12792     69   1759    173   .077    5.3   135   13.3    28   16.0
7  3 MG      1577   2.200   13.69    1812   16.048   28939    284   8014   1085   .113   32.1   906  122.6   120    3.0
8 16 MG       829   1.300   14.26     575   15.643   12792     68   2147    156   .077    5.2   165   12.0    28   16.0
9 C.T.      31106   2.870    7.93      50   13.911    2449    568   1059      3   .143   81.2   151     .4     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.6    69    8.5
1 IDLE       7891   3.040   10.72      50   14.549    2589    140   1093      3   .232   32.6   254     .7     0   15.8
2 16 MG      1029   1.490   14.06     560   15.653   12792     84   2460    152   .077    6.5   189   11.7    28   16.0
3 10 MG       497    .430   14.52    1637   15.000   19142     63   1108    694   .147    9.3   163  102.0    68   10.0
4 16 MG       872   1.350   14.20     575   15.637   12792     71   2231    156   .077    5.5   172   12.0    28   16.0
5 19 MG      1567   2.160   13.69     200   16.007    9294     91   2535     39   .057    5.2   144    2.2     7   19.0
6 16 MG      1029   1.200   14.24     612   15.543   12792     84   1996    167   .077    6.5   154   12.9    28   16.0
7  3 MG      1520   2.250   13.69    1875   16.092   28939    273   8173   1119   .113   30.9   924  126.5   120    3.0
8 16 MG       829   1.320   14.22     562   15.623   12792     68   2183    153   .077    5.2   168   11.8    28   16.0
9 C.T.      30396   3.100    7.85      38   13.990    2449    532   1096      2   .143   76.1   157     .3     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.5    71    8.6
1 IDLE       7193   3.080   11.28      50   15.079    2589    124   1068      3   .232   28.7   248     .7     0   15.8
2 16 MG      1829   1.380   14.08     530   15.643   12792    150   2280    144   .077   11.5   176   11.1    28   16.0
3 10 MG       611    .440   14.48    1675   14.981   19142     78   1136    711   .147   11.5   167  104.5    68   10.0
4 16 MG       900   1.230   14.25     600   15.570   12792     74   2041    164   .077    5.7   157   12.6    28   16.0
5 19 MG      1506   2.180   13.77     212   16.101    9294     87   2543     41   .057    5.0   145    2.3     7   19.0
6 16 MG       946   1.760   14.09     662   15.945   12792     76   2862    176   .077    5.8   220   13.6    28   16.0
7  3 MG      1696   2.620   13.56    1987   16.350   28939    300   9368   1168   .113   33.9  1059  131.9   120    3.0
8 16 MG       870   1.350   13.97     597   15.407   12792     72   2264    148   .077    5.6   174   11.4    28   16.0
9 C.T.      28191   2.820    8.12      25   13.759    2449    502   1014      1   .143   71.8   145     .2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.5    76    8.8
1 IDLE       7193   3.080   11.28      50   15.079    2589    124   1068      3   .232   28.7   248     .7     0   15.8
2 16 MG      1193   1.450   14.03     515   15.599   12792     94   2403    140   .077    7.2   185   10.8    28   16.0
3 10 MG       569    .440   14.44    1750   14.937   19142     73   1139    745   .147   10.7   167  109.5    68   10.0
4 16 MG       958   1.320   14.25     562   15.666   12792     78   2177    152   .077    6.0   168   11.7    28   16.0
5 19 MG      1520   2.170   13.70     200   16.022    9294     88   2544     39   .057    5.0   145    2.2     7   19.0
6 16 MG      1086   1.230   14.23     560   15.569   12792     89   2041    150   .077    6.9   157   11.6    28   16.0
7  3 MG      1721   2.320   13.62    1900   16.112   28939    309   8417   1133   .113   34.9   951  128.0   120    3.0
8 16 MG       900   1.320   14.14     575   15.550   12792     74   2193    157   .077    5.7   169   12.1    28   16.0
9 C.T.      27713   2.890    7.89      20   13.551    2449    501   1055      1   .143   71.6   151     .2     0   23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------    5.4    72    8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------    5.5    70    8.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------    5.5    74    8.8
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     5.5) + 0.65(     5.5) =     5.492   GM/BHP HR
                                       CO- NDIR 0.35(    70.2) + 0.65(    74.1) =    72.742   GM/BHP HR
                                       NO2-CL   0.35(     8.5) + 0.65(     8.8) =     8.724   GM/BHP HR
                                                            CORRECTED NO2 =     9.538   GM/BHP HR
                                                                     BSFC =      .778   LB/BHP HR
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                      TABLE H-4. MASS EMISSIONS BY NINE-MODE FTP
ENGINE B-0   TEST-48  RUN-3   1973 STANDARD ENGINE  07-09-73     K =1.109     HUM =129.9  GR/LB
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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.     WEIGHTED GM/HR            MAN.
MODE          HC      CO     CO2      NO    CARBON   CONS.      HC     CO      NO2    FACT.   HC        CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE        422   3.260  10.50      69   14.216    2586       83    1198       4    .232   19.2      278     .9     0    15.8
2 16 HG        62   1.210  13.78     525   15.057   12792       57    2077     148    .077    4.4      160   11.4    28    16.0
3 10 HG        33    .480  13.94    1648   14.456   19142       47    1284     746    .147    6.9      189  109.7    68    10.0
4 16 HG        35   1.110  13.81     592   14.958   12792       32    1918     168    .077    2.5      148   12.9    28    16.0
5 19 HG        46   2.020  13.39     210   15.460    9299       30    2454      42    .057    1.7      140    2.4     7    19.0
6 16 HG        33   1.070  13.87     626   14.976   12792       30    1846     178    .077    2.3      142   13.7    28    16.0
7  3 HG        53   2.100  13.40    1983   15.557   28939      106    7891    1225    .113   12.0      892  138.4   120     3.0
8 16 HG        32   1.250  13.90     539   15.185   12792       29    2127     151    .077    2.2      164   11.6    28    16.0
9 C.T.       2128   2.270   8.32      66   12.888    2449      437     871       4    .143   62.4      125     .6     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   3.5       69    9.3
1 IDLE        422   3.260  10.50      69   14.216    2586       83    1198       4    .232   19.2      278     .9     0    15.8
2 16 HG        53   1.240  13.84     595   15.137   12792       48    2117     167    .077    3.7      163   12.9    28    16.0
3 10 HG        29    .540  14.16    1803   14.731   19142       41    1417     778    .147    6.0      208  114.3    68    10.0
4 16 HG        35   1.400  13.94     555   15.378   12792       31    2352     153    .077    2.4      181   11.8    28    16.0
5 19 HG        45   2.260  13.42     216   15.729    9299       29    2699      42    .057    1.6      154    2.4     7    19.0
6 16 HG        38   1.150  14.17     621   15.358   12792       31    1935     172    .077    2.4      149   13.2    28    16.0
7  3 HG        54   2.260  13.58    1905   15.898   28939      106    8310    1151    .113   12.0      939  130.1   120     3.0
8 16 HG        38   1.380  14.10     559   15.518   12792       31    2298     153    .077    2.4      177   11.8    28    16.0
9 C.T.       2394   2.940   7.97      75   13.496    2449      469    1078       5    .143   67.1      154     .6     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   3.6       74    9.1
1 IDLE        378   2.850  11.20      61   14.458    2586       73    1030       4    .232   16.9      239     .8     0    15.8
2 16 HG        53   1.540  13.88     560   15.477   12792       47    2571     154    .077    3.6      198   11.8    28    16.0
3 10 HG        27    .490  14.35    1738   14.869   19142       38    1274     743    .147    5.5      187  109.2    68    10.0
4 16 HG        36   1.320  14.14     616   15.499   12792       32    2201     169    .077    2.5      169   13.0    28    16.0
5 19 HG        45   2.180  13.59     203   15.819    9299       29    2589      40    .057    1.6      148    2.3     7    19.0
6 16 HG        33   1.210  14.17     607   15.416   12792       30    2028     167    .077    2.3      156   12.9    28    16.0
7  3 HG        52   2.210  13.62    1982   15.886   28939      102    8132    1199    .113   11.6      919  135.5   120     3.0
8 16 HG        32   1.330  14.08     563   15.445   12792       29    2225     155    .077    2.2      171   11.9    28    16.0
9 C.T.       2374   2.540   8.22      70   13.324    2449      471     943       4    .143   67.4      135     .6     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   3.5       71    9.1
1 IDLE        378   2.850  11.20      61   14.458    2586       73    1030       4    .232   16.9      239     .8     0    15.8
2 16 HG        50   1.350  13.97     560   15.374   12792       45    2269     155    .077    3.5      175   11.9    28    16.0
3 10 HG        27    .460  14.29    1830   14.779   19142       38    1204     787    .147    5.6      177  115.7    68    10.0
4 16 HG        34   1.340  14.12     551   15.497   12792       30    2234     151    .077    2.3      172   11.6    28    16.0
5 19 HG        45   2.260  13.56     199   15.869    9299       28    2675      39    .057    1.6      152    2.2     7    19.0
6 16 HG        35   1.320  14.13     541   15.488   12792       31    2202     148    .077    2.4      170   11.4    28    16.0
7  3 HG        52   2.230  13.64    2040   15.926   28939      102    8185    1231    .113   11.5      925  139.1   120     3.0
8 16 HG        34   1.340  14.07     586   15.447   12792       30    2242     161    .077    2.3      173   12.4    28    16.0
9 C.T.       2235   2.410   8.41      65   13.234    2449      447     901       4    .143   63.9      129     .6     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   3.4       71    9.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------   3.5       71    9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------   3.4       71    9.3
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     3.5) + 0.65(     3.4) =    3.469   GM/BHP HR
                                       CO- NDIR 0.35(    71.2) + 0.65(    71.1) =   71.107   GM/BHP HR
                                       NO2-NDIR 0.35(     9.2) + 0.65(     9.3) =    9.239   GM/BHP HR
                                                           CORRECTED NO2 =   10.245   GM/BHP HR
                                                                    BSFC =     .778   LB/BHP HR
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              CONCENTRATION AS MEASURED     TOTAL    FUEL       CALCULATED GM/HR       WT.      WEIGHTED GM/HR            MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC     CO      NO2    FACT.  HC-FID     CO   NO2-CL  HP    VAC.
---------------------------------------------------------------------------------------------------------------------------
1 IDLE       5636   3.260  10.50      45   14.324    2586      102    1189       3    .232   23.6      276     .6     0    15.8
2 16 HG      1423   1.210  13.78     510   15.132   12792      120    2066     143    .077    9.3      159   11.0    28    16.0
3 10 HG       410    .480  13.94    1687   14.461   19142       54    1283     741    .147    8.0      189  109.0    68    10.0
4 16 HG       683   1.110  13.81     575   14.988   12792       58    1914     163    .077    4.5      147   12.5    28    16.0
5 19 HG      1228   2.020  13.39     212   15.533    9299       74    2443      42    .057    4.2      139    2.4     7    19.0
6 16 HG       711   1.070  13.87     612   15.011   12792       61    1842     173    .077    4.7      142   13.3    28    16.0
7  3 HG      1429   2.100  13.40    1975   15.643   28939      264    7848    1213    .113   29.9      887  137.1   120     3.0
8 16 HG       698   1.250  13.90     525   15.220   12792       59    2122     146    .077    4.5      163   11.3    28    16.0
9 C.T.      24544   2.270   8.32      30   13.044    2449      462     861       2    .143   66.0      123     .3     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   4.7       68    9.1
1 IDLE       5636   3.260  10.50      45   14.324    2586      102    1189       3    .232   23.6      276     .6     0    15.8
2 16 HG      1367   1.240  13.84     565   15.217   12792      115    2106     158    .077    8.9      162   12.1    28    16.0
3 10 HG       454    .540  14.16    1800   14.745   19142       59    1416     776    .147    8.7      208  114.0    68    10.0
4 16 HG       856   1.400  13.94     587   15.426   12792       71    2346     162    .077    5.5      181   12.4    28    16.0
5 19 HG      1317   2.260  13.42     212   15.812    9299       77    2685      41    .057    4.4      153    2.4     7    19.0
6 16 HG       870   1.150  14.17     612   15.407   12792       72    1929     169    .077    5.6      149   13.0    28    16.0
7  3 HG      1548   2.260  13.58    1925   15.995   28939      280    8260    1156    .113   31.6      933  130.7   120     3.0
8 16 HG       814   1.380  14.10     562   15.561   12792       67    2292     153    .077    5.2      176   11.8    28    16.0
9 C.T.      28183   2.940   7.97      30   13.728    2449      503    1059       2    .143   71.9      151     .3     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   5.1       73    9.1
1 IDLE       5311   2.850  11.20      40   14.581    2586       94    1021       2    .232   21.9      237     .5     0    15.8
2 16 HG      1600   1.540  13.88     545   15.580   12792      131    2554     149    .077   10.1      197   11.4    28    16.0
3 10 HG       518    .490  14.35    1750   14.891   19142       66    1272     747    .147    9.7      187  109.8    68    10.0
4 16 HG       842   1.320  14.14     625   15.544   12792       69    2194     171    .077    5.3      169   13.1    28    16.0
5 19 HG      1360   2.180  13.59     212   15.906    9299       80    2574      41    .057    4.5      147    2.3     7    19.0
6 16 HG       870   1.210  14.17     600   15.467   12792       72    2021     165    .077    5.5      156   12.7    28    16.0
7  3 HG      1561   2.210  13.62    1987   15.986   28939      283    8081    1194    .113   31.9      913  134.9   120     3.0
8 16 HG       828   1.330  14.08     575   15.493   12792       68    2218     158    .077    5.3      171   12.1    28    16.0
9 C.T.      25509   2.540   8.22      30   13.311    2449      469     944       2    .143   67.1      135     .3     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   5.0       71    9.1
1 IDLE       5311   2.850  11.20      40   14.581    2586       94    1021       2    .232   21.9      237     .5     0    15.8
2 16 HG      1541   1.350  13.97     540   15.474   12792      127    2254     148    .077    9.8      174   11.4    28    16.0
3 10 HG       639    .460  14.29    1825   14.814   19142       83    1201     783    .147   12.1      177  115.1    68    10.0
4 16 HG       914   1.340  14.12     550   15.551   12792       75    2227     150    .077    5.8      171   11.6    28    16.0
5 19 HG      1433   2.260  13.56     200   15.963    9299       83    2659      39    .057    4.8      152    2.2     7    19.0
6 16 HG      1057   1.320  14.13     525   15.556   12792       87    2193     143    .077    6.7      169   11.0    28    16.0
7  3 HG      1577   2.230  13.64    1987   16.028   28939      285    8133    1191    .113   32.2      919  134.6   120     3.0
8 16 HG       885   1.340  14.07     587   15.499   12792       73    2234     161    .077    5.6      172   12.4    28    16.0
9 C.T.      26402   2.410   8.41      30   13.460    2449      480     886       2    .143   68.7      127     .3     0    23.7
---------------CYCLE COMPOSITE IN GM/BHP HR---------------------------------------------   5.1       70    9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------------   4.9       71    9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------------   5.0       71    9.1
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     4.9) + 0.65(     5.0) =    4.997   GM/BHP HR
                                       CO- NDIR 0.35(    70.8) + 0.65(    70.7) =   70.716   GM/BHP HR
                                       NO2-CL   0.35(     9.1) + 0.65(     9.1) =    9.140   GM/BHP HR
                                                           CORRECTED NO2 =   10.136   GM/BHP HR
                                                                    BSFC =     .778   LB/BHP HR
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                          TABLE H-5.  MASS EMISSIONS BY NINE-MODE EPA
ENGINE-8-0   TEST-49  RUN-1   1973 STNADARD ENGINE     7-9-73      K =1.103      HUM =123.6  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR                   MAN.
MODE           HC      CO     CO2      NO   CARBON    CONS.     HC      CO      NO2     FACT.    HC        CO     NO2     HP      VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE         827   3.240    9.83     80   13.963     2722     174    1276       5     .232    40.4      296     1.2     0      15.9
2 30 PCT T      84    .960   13.70    941   14.751    13926      86    1831     295     .077     6.6      141    22.7    41      14.1
3 60 PCT T      48    .300   13.69   1887   14.092    20004      74     863     892     .147    10.9      127   131.2    82       7.6
4 30 PCT T      47    .800   13.89    888   14.741    13926      48    1527     279     .077     3.7      118    21.4    42      14.1
5 10 PCT T      51   1.580   13.48    286   15.115    10025      37    2117      63     .057     2.1      121     3.6    14      18.0
6 30 PCT T      40    .740   13.98    973   14.763    13926      41    1410     305     .077     3.1      109    23.5    41      14.1
7 90 PCT T      60   2.130   13.25   1988   15.445    28849     121    8037    1233     .113    13.7      908   139.3   123       2.7
8 30 PCT T      38    .790   13.86    941   14.691    13926      39    1513     296     .077     3.0      116    22.8    41      14.1
9 C.T.        1901   2.850    8.49     85   13.393     2676     410    1150       6     .143    58.7      164      .8     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.6       53     9.3
1 IDLE         827   3.240    9.83     80   13.963     2722     174    1276       5     .232    40.4      296     1.2     0      15.9
2 30 PCT T      55    .830   13.89    911   14.779    13926      56    1580     285     .077     4.3      122    21.9    41      14.1
3 60 PCT T      33    .160   13.77   1875   13.966    20004      51     463     892     .147     7.5       68   131.1    82       7.6
4 30 PCT T      37    .700   14.07    866   14.810    13926      38    1320     270     .077     2.9      102    20.8    42      14.1
5 10 PCT T      44   1.700   13.56    293   15.308    10025      31    2249      64     .057     1.8      128     3.6    14      18.0
6 30 PCT T      35    .740   14.05    802   14.828    13926      36    1404     250     .077     2.7      108    19.3    41      14.1
7 90 PCT T      54   2.140   13.24   1959   15.438    28849     109    8078    1215     .113    12.3      913   137.3   123       2.7
8 30 PCT T      34    .670   14.06    946   14.767    13926      35    1276     296     .077     2.7       98    22.8    41      14.1
9 C.T.        1849   2.980    8.83    139   13.807     2676     387    1167       9     .143    55.3      167     1.3     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.3       51     9.1
1 IDLE         334   3.140   10.84     50   14.341     2722      68    1204       3     .232    15.9      279      .7     0      15.9
2 30 PCT T      56    .860   13.87    839   14.790    13926      57    1636     262     .077     4.4      126    20.2    41      14.1
3 60 PCT T      34    .250   14.00   1984   14.287    20004      51     707     922     .147     7.6      104   135.6    82       7.6
4 30 PCT T      37    .690   14.02    878   14.750    13926      38    1316     275     .077     2.9      101    21.2    42      14.1
5 10 PCT T      45   1.680   13.58    270   15.309    10025      32    2222      59     .057     1.8      127     3.3    14      18.0
6 30 PCT T      35    .690   14.01    872   14.738    13926      36    1317     274     .077     2.8      101    21.1    41      14.1
7 90 PCT T      53   2.110   13.19   2003   15.357    28849     108    8007    1249     .113    12.2      905   141.2   123       2.7
8 30 PCT T      35    .860   13.96    882   14.858    13926      35    1628     274     .077     2.7      125    21.1    41      14.1
9 C.T.        2626   3.180    8.20     81   14.216     2676     534    1209       5     .143    76.3      173      .7     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.2       52     9.2
1 IDLE         334   3.140   10.84     50   14.341     2722      68    1204       3     .232    15.9      279      .7     0      15.9
2 30 PCT T      51    .900   13.81    823   14.765    13926      52    1715     258     .077     4.0      132    19.8    41      14.1
3 60 PCT T      31    .220   13.91   2080   14.163    20004      47     628     975     .147     7.0       92   143.4    82       7.6
4 30 PCT T      35    .750   13.98    839   14.768    13926      36    1429     263     .077     2.7      110    20.2    42      14.1
5 10 PCT T      44   1.790   13.48    248   15.318    10025      31    2366      54     .057     1.8      135     3.1    14      18.0
6 30 PCT T      34    .740   13.93    906   14.707    13926      35    1415     285     .077     2.7      109    21.9    41      14.1
7 90 PCT T      53   2.100   13.21   2075   15.367    28849     107    7964    1293     .113    12.1      900   146.1   123       2.7
8 30 PCT T      35    .820   13.95    842   14.808    13926      36    1558     263     .077     2.7      120    20.2    41      14.1
9 C.T.        2641   3.000    8.43     74   14.282     2676     534    1135       5     .143    76.4      162      .7     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.2       52     9.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     3.4       52     9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     3.2       52     9.4
FOUR CYCLE COMPOSITE -
                                            HC- NDIR 0.35(     3.4) + 0.65(     3.2) =     3.276   GM/BHP HR
                                            CO- NDIR 0.35(    51.9) + 0.65(    51.6) =    51.728   GM/BHP HR
                                            NO2-NDIR 0.35(     9.2) + 0.65(     9.4) =     9.311   GM/BHP HR
                                                              CORRECTED NO2 =    10.272   GM/BHP HR
                                                                       BSFC =      .674   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL     FUEL       CALCULATED GM/HR          WT.       WEIGHTED GM/HR                   MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON    CONS.     HC      CO      NO2     FACT.  HC-FID      CO  NO2-CL     HP      VAC.
---------------------------------------------------------------------------------------------------------------------
1 IDLE        9191   3.240    9.83     50   13.989     2722     179    1273       3     .232    41.5      295      .7     0      15.9
2 30 PCT T    1192    .960   13.70    885   14.779    13926     112    1827     277     .077     8.7      141    21.3    41      14.1
3 60 PCT T     382    .300   13.69   1862   14.028    20004      54     864     882     .147     8.0      127   129.6    82       7.6
4 30 PCT T     554    .800   13.89    850   14.745    13926      52    1526     267     .077     4.0      118    20.5    42      14.1
5 10 PCT T     975   1.580   13.48    287   15.158    10025      65    2111      63     .057     3.7      120     3.6    14      18.0
6 30 PCT T     511    .740   13.98    937   14.771    13926      48    1409     293     .077     3.7      109    22.6    41      14.1
7 90 PCT T    1556   2.130   13.25   1925   15.536    28849     289    7990    1187     .113    32.6      903   134.1   123       2.7
8 30 PCT T     522    .790   13.86    925   14.702    13926      49    1512     291     .077     3.8      116    22.4    41      14.1
9 C.T.       23429   2.850    8.49     60   13.682     2676     458    1126       4     .143    65.5      161      .6     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.3       53     9.0
1 IDLE        9191   3.240    9.83     50   13.989     2722     179    1273       3     .232    41.5      295      .7     0      15.9
2 30 PCT T    1250    .830   13.89    865   14.845    13926     117    1573     269     .077     9.0      121    20.7    41      14.1
3 60 PCT T     395    .160   13.77   1825   13.970    20004      57     463     868     .147     8.3       68   127.5    82       7.6
4 30 PCT T     555    .700   14.07    850   14.825    13926      52    1328     265     .077     4.0      102    20.4    42      14.1
5 10 PCT T    1056   1.700   13.56    288   15.366    10025      69    2240      62     .057     3.9      128     3.6    14      18.0
6 30 PCT T     540    .740   14.05    800   14.844    13926      51    1402     249     .077     3.9      108    19.2    41      14.1
7 90 PCT T    1428   2.140   13.24   1962   15.523    28849     265    8034    1211     .113    30.0      908   136.8   123       2.7
8 30 PCT T     455    .670   14.06    900   14.775    13926      43    1276     282     .077     3.3       98    21.7    41      14.1
9 C.T.       23072   2.980    8.83    125   14.117     2676     437    1141       8     .143    62.5      163     1.1     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.2       50     8.9
1 IDLE        5364   3.140   10.84     50   14.516     2722     101    1189       3     .232    23.3      276      .7     0      15.9
2 30 PCT T    1250    .860   13.87    850   14.855    13926     117    1629     265     .077     9.0      125    20.4    41      14.1
3 60 PCT T     453    .250   14.00   1975   14.295    20004      63     707     918     .147     9.3      104   134.9    82       7.6
4 30 PCT T     610    .690   14.02    875   14.771    13926      58    1314     274     .077     4.4      101    21.1    42      14.1
5 10 PCT T    1098   1.680   13.58    270   15.370    10025      72    2213      58     .057     4.1      126     3.3    14      18.0
6 30 PCT T     610    .690   14.01    875   14.761    13926      58    1315     274     .077     4.4      101    21.1    41      14.1
7 90 PCT T    1555   2.110   13.19   2000   15.455    28849     290    7956    1239     .113    32.8      899   140.1   123       2.7
8 30 PCT T     582    .860   13.96    862   14.878    13926      54    1626     268     .077     4.2      125    20.6    41      14.1
9 C.T.       23432   3.180    8.20     75   13.723     2676     457    1253       5     .143    65.3      179      .7     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     4.0       52     9.2
1 IDLE        5364   3.140   10.84     50   14.516     2722     101    1189       3     .232    23.3      276      .7     0      15.9
2 30 PCT T    1193    .900   13.81    800   14.829    13926     112    1707     249     .077     8.6      131    19.2    41      14.1
3 60 PCT T     438    .220   13.91   2025   14.174    20004      62     627     949     .147     9.1       92   139.5    82       7.6
4 30 PCT T     653    .750   13.98    825   14.795    13926      61    1426     258     .077     4.7      110    19.9    42      14.1
5 10 PCT T    1170   1.790   13.48    250   15.387    10025      76    2356      54     .057     4.3      134     3.1    14      18.0
6 30 PCT T     625    .740   13.93    900   14.732    13926      59    1413     282     .077     4.5      109    21.7    41      14.1
7 90 PCT T    1598   2.100   13.21   2025   15.470    28849     298    7911    1254     .113    33.7      894   141.7   123       2.7
8 30 PCT T     582    .820   13.95    825   14.828    13926      55    1556     257     .077     4.2      120    19.8    41      14.1
9 C.T.       22115   3.000    8.43     63   13.641     2676     434    1189       4     .143    62.0      170      .6     0      23.7
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     3.9       52     9.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     4.3       52     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     3.9       52     9.2
FOUR CYCLE COMPOSITE -
                                            HC- FID  0.35(     4.3) + 0.65(     3.9) =     4.059   GM/BHP HR
                                            CO- NDIR 0.35(    51.6) + 0.65(    51.5) =    51.571   GM/BHP HR
                                            NO2-CL   0.35(     8.9) + 0.65(     9.2) =     9.127   GM/BHP HR
                                                              CORRECTED NO2 =    10.069   GM/BHP HR
                                                                       BSFC =      .674   LB/BHP HR
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                         TABLE H-6. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 8-0   TEST-49  RUN-2   1973 STANDARD ENGINE     7-9-73        K =1.098      HUM =119.1  GR/LB
-----------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE             HC      CO     CO2     NO   CARBON   CONS.      HC      CO    NO2   FACT.   HC        CO     NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          418   3.600   10.52     82   14.571    2722      84    1358      5   .232   19.6      315     1.2      0   15.9
2 30 PCT T       63    .920   13.86    908   14.848   13926      64    1793    283   .077    4.9      138    21.8     41   14.1
3 60 PCT T       30    .270   13.72   1825   14.022   20009      46     778    864   .147    6.8      114   127.1     82    7.6
4 30 PCT T       32    .810   14.08    892   14.925   13926      32    1527    276   .077    2.5      118    21.3     42   14.1
5 10 PCT T       35   1.650   13.60    306   15.288   10025      25    2186     67   .057    1.4      125     3.8     14   18.0
6 30 PCT T       31    .830   14.08    897   14.943   13926      31    1562    278   .077    2.4      120    21.4     41   14.1
7 90 PCT T       48   2.040   13.47   2031   15.562   28849      96    7639   1250   .113   10.9      863   141.3    123    2.7
8 30 PCT T       27    .830   14.12    884   14.979   13926      27    1559    273   .077    2.1      120    21.0     41   14.1
9 C.T.         1584   2.500    9.02     89   13.231    2676     346    1021      6   .143   49.5      146      .9      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.5       52     9.1
1 IDLE          418   3.600   10.52     82   14.571    2722      84    1358      5   .232   19.6      315     1.2      0   15.9
2 30 PCT T       47   1.000   13.95    845   15.001   13926      47    1875    260   .077    3.6      144    20.1     41   14.1
3 60 PCT T       26    .230   13.83   1907   14.088   20009      40     660    899   .147    5.9       97   132.2     82    7.6
4 30 PCT T       29    .880   14.17    864   15.081   13926      29    1641    265   .077    2.2      126    20.4     42   14.1
5 10 PCT T       37   1.840   13.55    275   15.430   10025      26    2415     59   .057    1.5      138     3.4     14   18.0
6 30 PCT T       32    .850   14.16    889   15.045   13926      32    1589    273   .077    2.5      122    21.0     41   14.1
7 90 PCT T       47   2.050   13.46   2044   15.561   28849      94    7677   1258   .113   10.6      868   142.2    123    2.7
8 30 PCT T       26    .760   14.08    899   14.868   13926      26    1438    280   .077    2.0      111    21.5     41   14.1
9 C.T.         1619   2.770    9.00     85   13.519    2676     346    1108      6   .143   49.5      158      .8      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.5       53     9.2
1 IDLE          200   3.380   11.08     65   14.676    2722      40    1266      4   .232    9.3      294      .9      0   15.9
2 30 PCT T       56   1.120   13.93    830   15.110   13926      56    2085    254   .077    4.3      161    19.6     41   14.1
3 60 PCT T       27    .250   14.08   1947   14.359   20009      41     704    901   .147    6.0      103   132.4     82    7.6
4 30 PCT T       33    .890   14.16    867   15.086   13926      33    1660    266   .077    2.5      128    20.5     42   14.1
5 10 PCT T       39   1.900   13.57    279   15.512   10025      27    2480     59   .057    1.6      141     3.4     14   18.0
6 30 PCT T       31    .910   14.09    858   15.033   13926      31    1703    264   .077    2.4      131    20.3     41   14.1
7 90 PCT T       48   2.120   13.45   2000   15.622   28849      96    7908   1226   .113   10.8      894   138.6    123    2.7
8 30 PCT T       30    .930   14.08    859   15.042   13926      30    1739    262   .077    2.3      134    20.2     41   14.1
9 C.T.         1785   2.950    8.81     90   13.688    2676     377    1165      6   .143   53.9      167      .8      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.4       54     9.0
1 IDLE          200   3.380   11.08     65   14.676    2722      40    1266      4   .232    9.3      294      .9      0   15.9
2 30 PCT T       56   1.210   13.83    847   15.100   13926      56    2264    259   .077    4.3      174    20.0     41   14.1
3 60 PCT T       27    .300   14.08   2046   14.409   20009      40     841    943   .147    6.0      124   138.6     82    7.6
4 30 PCT T       32   1.020   14.01    897   15.065   13926      32    1908    275   .077    2.5      147    21.2     42   14.1
5 10 PCT T       38   1.980   13.54    262   15.561   10025      26    2577     56   .057    1.5      147     3.2     14   18.0
6 30 PCT T       34   1.040   13.97    895   15.047   13926      34    1944    275   .077    2.6      150    21.2     41   14.1
7 90 PCT T       52   2.280   13.28   1967   15.616   28849     104    8508   1206   .113   11.7      961   136.3    123    2.7
8 30 PCT T       31    .990   14.06    872   15.083   13926      31    1846    267   .077    2.4      142    20.6     41   14.1
9 C.T.         1658   3.070    8.50     90   13.441    2676     357    1235      6   .143   51.0      177      .9      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    2.3       59     9.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    2.5       52     9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    2.3       57     9.1
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     2.5) + 0.65(     2.3) =    2.389   GM/BHP HR
                                    CO- NDIR 0.35(    52.3) + 0.65(    56.5) =   55.043   GM/BHP HR
                                    NO2-NDIR 0.35(     9.1) + 0.65(     9.1) =    9.115   GM/BHP HR
                                                        CORRECTED NO2 =   10.008   GM/BHP HR
                                                                 BSFC =     .674   LB/BHP HR


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                CONCENTRATION AS MEASURED   TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE          HC-FID     CO     CO2  NO-CL   CARBON   CONS.      HC      CO    NO2   FACT.  HC-FID     CO  NO2-CL    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         6105   3.600   10.52     50   14.731    2722     113    1344      3   .232   26.2      312      .7      0   15.9
2 30 PCT T     1080    .920   13.86    863   14.888   13926     101    1738    268   .077    7.8      134    20.6     41   14.1
3 60 PCT T      282    .270   13.72   1775   14.018   20009      40     778    841   .147    5.9      114   123.6     82    7.6
4 30 PCT T      466    .810   14.08    850   14.937   13926      43    1525    263   .077    3.3      117    20.3     42   14.1
5 10 PCT T      827   1.650   13.60    288   15.333   10025      54    2179     63   .057    3.1      124     3.6     14   18.0
6 30 PCT T      512    .830   14.08    875   14.961   13926      48    1561    270   .077    3.7      120    20.8     41   14.1
7 90 PCT T     1929   2.040   13.47 [illegible] 15.653  28849     263    7595   1208   .113   29.8      858   136.6    123    2.7
8 30 PCT T      469    .830   14.12 [illegible] 14.997  13926      44    1557    262   .077    3.4      120    20.2     41   14.1
9 C.T.        20803   2.500    9.02     73   13.600    2676     409     994      5   .143   58.5      142      .7      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.6       52     8.8
1 IDLE         6105   3.600   10.52     50   14.731    2722     113    1344      3   .232   26.2      312      .7      0   15.9
2 30 PCT T      939   1.000   13.95    825   15.044   13926      87    1870    254   .077    6.7      144    19.6     41   14.1
3 60 PCT T      353    .230   13.83   1875   14.098   20009      50     659    883   .147    7.4       97   129.9     82    7.6
4 30 PCT T      555    .880   14.17    850   15.108   13926      51    1639    260   .077    3.9      126    20.0     42   14.1
5 10 PCT T     1013   1.840   13.55    275   15.491   10025      66    2405     59   .057    3.7      137     3.4     14   18.0
6 30 PCT T      626    .850   14.16    875   15.073   13926      58    1586    268   .077    4.5      122    20.7     41   14.1
7 90 PCT T     1544   2.050   13.46   2012   15.664   28849     284    7626   1230   .113   32.1      862   139.0    123    2.7
8 30 PCT T      483    .760   14.08    875   14.888   13926      45    1436    272   .077    3.5      111    20.9     41   14.1
9 C.T.        19073   2.770    9.00     63   13.677    2676     373    1095      4   .143   53.4      157      .6      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.6       52     9.0
1 IDLE         4648   3.380   11.08     50   14.925    2722      85    1248      3   .232   19.7      289      .7      0   15.9
2 30 PCT T     1333   1.120   13.93    800   15.183   13926     122    2075    244   .077    9.4      160    18.8     41   14.1
3 60 PCT T      410    .250   14.08   1900   14.371   20009      57     703    878   .147    8.4      103   129.1     82    7.6
4 30 PCT T      669    .890   14.16    880   15.117   13926      62    1656    260   .077    4.7      128    20.0     42   14.1
5 10 PCT T     1086   1.900   13.57    275   15.579   10025      70    2470     59   .057    4.0      141     3.3     14   18.0
6 30 PCT T      697    .910   14.09    862   15.070   13926      64    1699    264   .077    5.0      131    20.4     41   14.1
7 90 PCT T     1530   2.120   13.45   2000   15.723   28849     281    7857   1218   .113   31.7      888   137.7    123    2.7
8 30 PCT T      555    .930   14.08    837   15.065   13926      51    1737    257   .077    3.9      134    19.8     41   14.1
9 C.T.        21289   2.950    8.81     63   13.889    2676     410    1148      4   .143   58.7      164      .6      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.7       54     8.9
1 IDLE         4648   3.380   11.08     50   14.925    2722      85    1248      3   .232   19.7      289      .7      0   15.9
2 30 PCT T     1401   1.210   13.83    813   15.180   13926     129    2292    248   .077    9.9      177    19.1     41   14.1
3 60 PCT T      397    .300   14.08   2060   14.420   20009      55     841    944   .147    8.1      124   138.8     82    7.6
4 30 PCT T      683   1.020   14.01    887   15.098   13926      63    1900    272   .077    4.9      146    20.9     42   14.1
5 10 PCT T     1058   1.980   13.54    250   15.626   10025      68    2566     53   .057    3.9      146     3.0     14   18.0
6 30 PCT T      769   1.040   13.97    875   15.087   13926      71    1939    268   .077    5.5      149    20.6     41   14.1
7 90 PCT T     1616   2.280   13.28   1950   15.712   28849     278    8457   1189   .113   31.4      956   134.3    123    2.7
8 30 PCT T      627    .990   14.06    850   15.113   13926      58    1843    260   .077    4.5      142    20.0     41   14.1
9 C.T.        22598   3.070    8.50     62   13.910    2676     435    1193      4   .143   62.2      171      .6      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------    3.8       58     9.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------    3.6       52     8.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------    3.7       56     9.0
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     3.6) + 0.65(     3.7) =    3.668   GM/BHP HR
                                    CO- NDIR 0.35(    52.0) + 0.65(    56.1) =   54.643   GM/BHP HR
                                    NO2-CL   0.35(     8.9) + 0.65(     9.0) =    8.933   GM/BHP HR
                                                        CORRECTED NO2 =    9.808   GM/BHP HR
                                                                 BSFC =     .674   LB/BHP HR
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                  TABLE H-7. MASS EMISSIONS BY NINE-MODE EPA
ENGINE 8-0    TEST-49  RUN-3   1973 STANDARD ENGINE     7-9-73      K =1.096      HUM =117.7  GR/LB
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MODE           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
               HC      CO     CO2     NO    CARBON   CONS.     HC      CO     NO2    FACT.    HC      CO     NO2     HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         345   3.760  10.88     81   15.013    2722      68    1377      5    .232    15.7    319     1.1      0   15.9
2 30 PCT T      59   1.100  14.09    846   15.254   13926      58    2029    256    .077     4.5    156    19.7     41   14.1
3 60 PCT T      28    .250  14.23   1957   14.510   20004      42     696    896    .147     6.1    102   131.7     82    7.6
4 30 PCT T      29    .750  14.37    826   15.151   13926      29    1392    252    .077     2.2    107    19.4     42   14.1
5 10 PCT T      38   1.620  13.95    283   15.611   10025      26    2101     60    .057     1.5    120     3.4     14   18.0
6 30 PCT T      27    .770  14.31    869   15.109   13926      27    1434    266    .077     2.1    110    20.5     41   14.1
7 90 PCT T      49   2.010  13.59   2000   15.653   28849      98    7483   1224    .113    11.0    846   138.3    123    2.7
8 30 PCT T      25    .790  14.47    873   15.237   13926      25    1366    265    .077     1.9    105    20.4     41   14.1
9 C.T.        1769   3.050   8.37     91   13.331    2676     384    1237      6    .143    54.8    177      .9      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     2.5     52     9.0
1 IDLE         345   3.760  10.88     81   15.013    2722      68    1377      5    .232    15.7    319     1.1      0   15.9
2 30 PCT T      56    .970  14.22    850   15.244   13926      49    1790    258    .077     3.8    138    19.9     41   14.1
3 60 PCT T      27    .210  14.23   1883   14.469   20004      40     586    864    .147     5.9     86   127.1     82    7.6
4 30 PCT T      28    .700  14.37    841   15.100   13926      28    1304    257    .077     2.1    100    19.8     42   14.1
5 10 PCT T      38   1.720  13.88    266   15.641   10025      26    2227     57    .057     1.5    127     3.2     14   18.0
6 30 PCT T      30    .620  14.00    885   14.652   13926      31    1190    279    .077     2.4     92    21.5     41   14.1
7 90 PCT T      50   2.080  13.54   2020   15.674   28849      99    7733   1234    .113    11.2    874   139.5    123    2.7
8 30 PCT T      28    .770  14.37    853   15.170   13926      28    1428    260    .077     2.1    110    20.0     41   14.1
9 C.T.        1506   2.930   8.86     81   13.916    2676     324    1181      5    .143    46.4    169      .8      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     2.3     51     8.9
1 IDLE         257   3.260  11.15     65   14.688    2722      51    1220      4    .232    11.9    283      .9      0   15.9
2 30 PCT T      48    .880  14.11    909   15.042   13926      48    1646    279    .077     3.7    127    21.5     41   14.1
3 60 PCT T      26    .210  14.20   2054   14.438   20004      39     588    945    .147     5.7     86   138.9     82    7.6
4 30 PCT T      27    .690  14.33    818   15.049   13926      27    1290    251    .077     2.1     99    19.4     42   14.1
5 10 PCT T      39   1.630  13.83    255   15.502   10025      27    2129     55    .057     1.6    121     3.1     14   18.0
6 30 PCT T      27    .650  14.30    849   14.979   13926      27    1221    262    .077     2.1     94    20.2     41   14.1
7 90 PCT T      49   1.980  13.51   2000   15.543   28849      98    7424   1233    .113    11.1    839   139.3    123    2.7
8 30 PCT T      26    .710  14.38    848   15.118   13926      26    1321    259    .077     2.0    102    20.0     41   14.1
9 C.T.        1736   2.720   8.85     89   13.445    2676     373    1094      6    .143    53.4    156      .8      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     2.4     48     9.2
1 IDLE         257   3.260  11.15     65   14.688    2722      51    1220      4    .232    11.9    283      .9      0   15.9
2 30 PCT T      50    .910  14.09    823   15.054   13926      50    1700    253    .077     3.8    131    19.5     41   14.1
3 60 PCT T      28    .180  14.08   1881   14.290   20004      42     509    874    .147     6.2     75   128.5     82    7.6
4 30 PCT T      30    .700  14.34    826   15.072   13926      30    1306    253    .077     2.3    101    19.5     42   14.1
5 10 PCT T      39   1.590  13.80    252   15.432   10025      27    2086     54    .057     1.6    119     3.1     14   18.0
6 30 PCT T      29    .670  14.28    815   14.981   13926      29    1258    252    .077     2.2     97    19.4     41   14.1
7 90 PCT T      49   1.940  13.54   2053   15.533   28849      98    7278   1266    .113    11.1    822   143.0    123    2.7
8 30 PCT T      28    .750  14.24    837   15.020   13926      28    1405    258    .077     2.2    108    19.8     41   14.1
9 C.T.        2071   3.070   8.26     83   13.567    2676     441    1223      5    .143    63.1    175      .8      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     2.6     48     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     2.4     51     9.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     2.5     48     9.1
FOUR CYCLE COMPOSITE -
                                     HC- NDIR 0.35(      2.4) + 0.65(      2.5) =     2.479   GM/BHP HR
                                     CO- NDIR 0.35(     51.3) + 0.65(     48.3) =    49.375   GM/BHP HR
                                     NO2-NDIR 0.35(      9.0) + 0.65(      9.1) =     9.045   GM/BHP HR
                                                         CORRECTED NO2 =     9.916   GM/BHP HR
                                                                  BSFC =      .674   LB/BHP HR


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MODE           CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.       WEIGHTED GM/HR             MAN.
             HC-FID     CO     CO2  NO-CL   CARBON   CONS.     HC      CO     NO2    FACT.  HC-FID    CO   NO2-CL    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE        6472   3.760  10.88     50   15.287    2722     115    1352      3    .232    26.7    314      .7      0   15.9
2 30 PCT T    1198   1.100  14.09    787   15.310   13926     109    2021    238    .077     8.4    156    18.3     41   14.1
3 60 PCT T     269    .250  14.23   1887   14.507   20004      37     696    864    .147     5.4    102   127.0     82    7.6
4 30 PCT T     456    .750  14.37    813   15.166   13926      42    1391    248    .077     3.2    107    19.1     42   14.1
5 10 PCT T     944   1.620  13.95    275   15.664   10025      60    2094     58    .057     3.4    119     3.3     14   18.0
6 30 PCT T     484    .770  14.31    850   15.128   13926      45    1432    260    .077     3.4    110    20.0     41   14.1
7 90 PCT T    1459   2.010  13.59   1950   15.746   28849     267    7439   1186    .113    30.2    841   134.0    123    2.7
8 30 PCT T     428    .790  14.47    862   15.253   13926      39    1365    261    .077     3.0    105    20.1     41   14.1
9 C.T.       24324   3.050   8.37     75   13.852    2676     470    1190      5    .143    67.2    170      .7      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.8     51     8.7
1 IDLE        6472   3.760  10.88     50   15.287    2722     115    1352      3    .232    26.7    314      .7      0   15.9
2 30 PCT T    1397    .970  14.22    825   15.330   13926     127    1780    249    .077     9.8    137    19.2     41   14.1
3 60 PCT T     397    .210  14.23   1862   14.480   20004      55     586    854    .147     8.1     86   125.5     82    7.6
4 30 PCT T     513    .700  14.37    825   15.121   13926      47    1302    252    .077     3.6    100    19.4     42   14.1
5 10 PCT T    1044   1.720  13.88    262   15.704   10025      67    2218     56    .057     3.8    126     3.2     14   18.0
6 30 PCT T     539    .620  14.00    875   14.679   13926      51    1189    276    .077     3.9     92    21.2     41   14.1
7 90 PCT T    1502   2.080  13.54   2012   15.770   28849     275    7686   1222    .113    31.0 [illegible] 138.1   123    2.7
8 30 PCT T     485    .770  14.37    850   15.188   13926      44    1426    259    .077     3.4 [illegible]  19.9    41   14.1
9 C.T.       24399   2.930   8.86     75   14.230    2676     459    1113      5    .143    65.6    159      .7      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.9     50     8.8
1 IDLE        6233   3.260  11.15     50   15.033    2722     113    1198      3    .232    26.2    277      .7      0   15.9
2 30 PCT T    1196    .880  14.11    875   15.110   13926     110    1648    268    .077     8.5    126    20.6     41   14.1
3 60 PCT T     348    .210  14.20   2000   14.447   20004      51     587    919    .147     7.5     86   135.2     82    7.6
4 30 PCT T     498    .690  14.33    813   15.070   13926      46    1288    249    .077     3.5     99    19.2     42   14.1
5 10 PCT T    1143   1.630  13.83    250   15.574   10025      74    2119     53    .057     4.2    121     3.0     14   18.0
6 30 PCT T     526    .650  14.30    825   15.003   13926      49    1219    254    .077     3.8     94    19.6     41   14.1
7 90 PCT T    1586   1.990  13.51   1963   15.649   28849     292    7373   1201    .113    33.0    833   135.8    123    2.7
8 30 PCT T     526    .710  14.38    825   15.143   13926      48    1319    252    .077     3.7    102    19.4     41   14.1
9 C.T.       22140   2.720   8.85     75   13.784    2676     430    1067      5    .143    61.5    153      .7      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     3.8     48     9.0
1 IDLE        6233   3.260  11.15     50   15.033    2722     113    1198      3    .232    26.2    277      .7      0   15.9
2 30 PCT T    1281    .910  14.09    800   15.128   13926     118    1692    244    .077     9.1    130    18.8     41   14.1
3 60 PCT T     381    .180  14.08   1875   14.298   20004      53     509    871    .147     7.8     75   128.0     82    7.6
4 30 PCT T     535    .700  14.34    813   15.094   13926      49    1305    249    .077     3.8    100    19.2     42   14.1
5 10 PCT T     971   1.590  13.80    250   15.487   10025      63    2079     54    .057     3.6    119     3.1     14   18.0
6 30 PCT T     484    .670  14.28    800   14.998   13926      45    1257    247    .077     3.5     97    19.0     41   14.1
7 90 PCT T    1486   1.940  13.54   2025   15.629   28849     274    7234   1241    .113    31.0    817   140.2    123    2.7
8 30 PCT T     518    .750  14.24    825   15.041   13926      47    1403    254    .077     3.7    108    19.5     41   14.1
9 C.T.       24748   3.070   8.26     75   13.805    2676     480    1202      5    .143    68.6    172      .7      0   23.7
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     4.0     48     8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------     3.9     51     8.7
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------     3.9     48     8.9
FOUR CYCLE COMPOSITE -
                                     HC- FID  0.35(      3.9) + 0.65(      3.9) =     3.902   GM/BHP HR
                                     CO- NDIR 0.35(     50.8) + 0.65(     47.9) =    48.915   GM/BHP HR
                                     NO2-CL   0.35(      8.7) + 0.65(      8.9) =     8.845   GM/BHP HR
                                                         CORRECTED NO2 =     9.696   GM/BHP HR
                                                                  BSFC =      .674   LB/BHP HR
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TABLE H-8. MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 8-0 TEST-50 RUN-1 1973 STANDARD ENGINE 07-10-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	550	0.0	0	16.9	6.3	14.3	0	5804	4.000	10.92	40
2	1200	7.0	2	19.2	11.2	14.9	0	2631	2.290	12.18	75
3	1200	29.8	7	18.3	12.6	14.8	0	2579	2.410	12.05	110
4	1200	68.3	16	16.5	15.7	14.8	0	2126	2.410	12.05	230
5	1200	96.3	22	15.2	17.9	14.8	0	2154	2.410	12.05	385
6	1200	190.8	44	10.2	25.6	15.3	0	1661	1.310	12.31	1275
7	1200	287.1	66	4.8	34.1	14.4	0	2003	2.620	12.18	1725
8	1200	313.2	72	3.5	36.6	14.7	0	1685	2.090	12.31	2162
9	1200	351.9	80	1.6	40.1	15.0	0	1509	1.560	12.31	2350
10	1200	381.6	87	.8	47.0	13.1	0	2820	5.150	11.16	962
11	550	0.0	0	17.8	6.3	14.0	0	7280	4.420	10.44	45
12	1200	0.0	0	21.8	6.7	16.6	0	35732	2.250	6.70	15
13	2300	360.6	158	1.2	85.7	12.9	0	1783	4.160	11.16	1150
14	2300	332.6	146	2.4	74.0	13.6	0	1431	2.450	12.05	1937
15	2300	295.9	130	4.1	67.5	13.7	0	1318	2.370	12.18	1950
16	2300	271.3	119	5.9	63.3	13.7	0	1318	2.290	12.18	1875
17	2300	180.3	79	10.0	45.7	14.9	0	88	.180	13.00	1750
18	2300	91.0	40	15.0	32.7	14.6	0	331	.720	12.86	700
19	2300	64.8	28	16.4	29.0	14.5	0	429	.900	12.86	450
20	2300	28.0	12	18.2	24.3	14.3	0	671	1.330	12.72	237
21	2300	7.0	3	19.2	22.0	14.2	0	706	1.480	12.59	162
22	550	0.0	0	16.5	6.3	16.6	0	8023	.930	9.77	50
23	2300	0.0	0	23.9	6.1	20.6	0	7912	.340	8.72	50

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	107.0	1490	2.4	.070	0.0	I	R	R	R
2	0.0	90.7	1595	8.6	.060	.1	0.0	56.71	997.3	5.4
3	0.0	100.2	1890	14.2	.060	.4	0.0	14.71	277.6	2.1
4	0.0	103.2	2363	37.1	.050	.8	0.0	6.61	151.4	2.4
5	0.0	119.2	2693	70.7	.030	.7	0.0	5.42	122.4	3.2
6	0.0	139.9	2229	356.5	.060	2.6	0.0	3.21	51.1	8.2
7	0.0	206.6	5457	590.5	0.000	0.0	0.0	3.15	83.2	9.0
8	0.0	192.0	4811	818.0	.040	2.9	0.0	2.68	67.2	11.4
9	0.0	195.7	4088	1012.2	0.000	0.0	0.0	2.43	50.8	12.6
10	0.0	362.3	13367	410.4	0.000	0.0	0.0	4.16	153.3	4.7
11	0.0	133.5	1637	2.7	.070	0.0	I	R	R	R
12	0.0	867.1	1103	1.2	.120	0.0	I	R	R	R
13	0.0	447.3	21077	957.6	.025	3.9	0.0	2.83	133.5	6.1
14	0.0	328.1	11345	1474.1	.055	8.0	0.0	2.25	77.9	10.1
15	0.0	274.9	9984	1350.1	.035	4.5	0.0	2.12	77.0	10.4
16	0.0	259.1	9096	1224.1	.060	7.1	0.0	2.18	76.6	10.3
17	0.0	13.8	571	913.2	.060	4.7	0.0	.17	7.2	11.6
18	0.0	36.1	1585	253.2	0.000	0.0	0.0	.90	39.8	6.4
19	0.0	40.9	1733	142.4	.065	1.8	0.0	1.44	61.1	5.0
20	0.0	52.4	2098	61.4	0.000	0.0	0.0	4.27	171.1	5.0
21	0.0	49.8	2110	38.0	0.000	0.0	0.0	16.26	688.2	12.4
22	0.0	199.3	467	4.1	.080	0.0	I	R	R	R
23	0.0	222.2	193	4.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.493	GRAM/BHP HR
	CO	88.428	GRAM/BHP HR
	NO2	9.310	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.673	LB/BHP HR

TABLE H-9. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 8-0 TEST 50 RUN-2 1973 STANDARD ENGINE 07-10-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	550	0.0	0	16.9	6.5	15.9	0	7769	2.750	9.12	35
2	1200	8.8	2	19.0	11.5	15.2	0	1892	2.090	10.09	70
3	1200	31.5	7	17.9	13.2	15.1	0	2015	1.980	10.92	100
4	1200	70.0	16	16.2	15.8	15.3	0	1817	1.830	10.92	290
5	1200	96.3	22	14.9	18.3	15.2	0	1761	1.830	10.92	320
6	1200	192.5	44	10.0	25.0	15.5	0	1115	1.230	11.16	1275
7	1200	288.5	66	4.7	34.2	15.1	0	1536	1.610	10.04	1812
8	1200	315.1	72	3.5	36.2	15.1	0	1550	1.560	11.16	2125
9	1200	353.6	81	1.7	40.2	15.1	0	1425	1.520	11.16	2312
10	1200	385.1	88	.8	46.8	13.5	0	2702	3.950	10.33	1025
11	550	0.0	0	17.5	6.4	14.6	0	6060	3.660	9.55	45
12	1200	0.0	0	21.7	6.7	17.1	0	37968	2.050	6.45	15
13	2300	362.4	159	1.2	85.2	12.9	0	1723	4.160	10.92	1162
14	2300	332.6	146	2.6	74.2	13.6	0	1322	2.370	11.72	2012
15	2300	297.6	130	4.2	67.6	13.7	0	1144	2.290	11.79	1950
16	2300	271.3	119	5.9	63.4	13.8	0	1059	2.210	11.72	1900
17	2300	182.0	80	9.8	45.9	15.2	0	49	.090	12.59	1725
18	2300	91.0	40	14.9	32.7	14.8	0	150	.480	12.59	637
19	2300	64.8	28	16.3	29.4	14.7	0	186	.610	11.28	437
20	2300	29.8	13	18.1	24.7	14.4	0	695	1.030	12.31	237
21	2300	7.0	3	19.1	22.3	14.2	0	773	1.260	12.31	162
22	550	0.0	0	16.5	6.3	16.3	0	8068	1.940	9.44	50
23	2300	0.0	0	23.9	6.1	20.7	0	8665	.360	8.62	50

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	181.1	1295	2.7	.070	0.0	I	R	R	R
2	0.0	79.8	1780	9.8	.060	.1	0.0	39.67	885.5	4.9
3	0.0	92.1	1828	15.2	.060	.4	0.0	12.79	254.0	2.1
4	0.0	100.7	2049	53.4	.050	.8	0.0	6.29	128.1	3.3
5	0.0	113.1	2374	68.2	.030	.7	0.0	5.14	107.9	3.1
6	0.0	101.1	2254	384.0	.060	2.6	0.0	2.30	51.2	8.7
7	0.0	201.9	4274	790.6	0.000	0.0	0.0	3.06	64.8	12.0
8	0.0	197.7	4019	899.8	.040	2.9	0.0	2.75	55.8	12.5
9	0.0	202.6	4366	1091.6	0.000	0.0	0.0	2.51	54.0	13.5
10	0.0	394.3	11641	496.5	0.000	0.0	0.0	4.48	132.3	5.6
11	0.0	127.3	1553	3.1	.070	0.0	I	R	R	R
12	0.0	938.4	1023	1.2	.120	0.0	I	R	R	R
13	0.0	436.6	21292	977.5	.025	4.0	0.0	2.75	134.2	6.2
14	0.0	313.0	11329	1580.8	.055	8.0	0.0	2.15	77.8	10.9
15	0.0	247.1	9993	1398.5	.035	4.6	0.0	1.90	76.7	10.7
16	0.0	217.0	9147	1292.5	.060	7.1	0.0	1.83	77.0	10.9
17	0.0	8.1	298	940.0	.060	4.8	0.0	.10	3.7	11.8
18	0.0	17.0	1099	239.7	0.000	0.0	0.0	.43	27.6	6.0
19	0.0	20.9	1380	162.5	.065	1.8	0.0	.74	48.6	5.7
20	0.0	58.1	1738	65.7	0.000	0.0	0.0	4.45	133.2	5.0
21	0.0	57.3	1886	39.9	0.000	0.0	0.0	18.70	615.4	13.0
22	0.0	189.2	919	3.9	.080	0.0	I	R	R	R
23	0.0	243.5	204	4.7	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.564	GRAM/BHP HR
	CO	86.069	GRAM/BHP HR
	NO2	9.814	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.671	LB/BHP HR

TABLE H-10. MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 8-0 TEST 50 RUN-3 1973 STANDARD ENGINE 07-10-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	550	0.0	0	16.9	6.5	16.2	0	6448	2.410	9.66	40
2	1200	8.8	2	19.0	11.5	15.6	0	2205	1.540	11.04	80
3	1200	31.5	7	18.0	13.3	15.5	0	2234	1.470	11.16	110
4	1200	70.0	16	16.2	15.9	15.6	0	1786	1.380	11.16	230
5	1200	96.2	22	15.0	18.0	15.6	0	1591	1.420	11.16	365
6	1200	192.6	44	10.0	25.1	15.7	0	1115	1.010	11.41	1325
7	1200	268.9	66	4.8	34.4	15.2	0	1412	1.540	11.28	1850
8	1200	315.1	72	3.6	36.3	15.2	0	1454	1.540	11.28	2050
9	1200	353.6	81	1.6	40.2	15.5	0	1339	1.240	11.28	2380
10	1200	385.1	88	.8	46.7	13.4	0	2553	4.210	10.33	987
11	550	0.0	0	17.5	6.4	15.3	0	10553	2.750	9.23	40
12	1200	0.0	0	21.7	6.7	16.4	0	36623	2.250	6.78	15
13	2300	362.4	159	1.2	84.9	12.9	0	1839	4.050	11.16	1187
14	2300	332.6	146	2.7	74.4	13.8	0	1217	2.210	12.05	2000
15	2300	297.6	130	4.4	67.8	13.8	0	1116	2.050	12.05	1925
16	2300	271.3	119	6.0	63.1	13.8	0	1146	2.090	12.18	1875
17	2300	182.1	80	9.9	45.8	15.0	0	7	.430	12.86	1662
18	2300	91.0	40	14.9	32.9	14.8	0	91	.380	12.86	687
19	2300	64.8	28	16.4	29.2	14.7	0	130	.550	12.86	450
20	2300	29.8	13	18.1	24.5	14.4	0	563	.990	12.72	250
21	2300	7.0	3	19.2	22.2	14.3	0	664	1.220	12.59	162
22	550	0.0	0	16.5	6.4	15.8	0	8785	2.450	9.66	50
23	2300	0.0	0	23.9	6.2	21.6	0	8253	.300	8.22	38

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	149.5	1129	3.1	.070	0.0	I	R	R	R
2	0.0	89.8	1268	10.8	.060	.1	0.0	44.69	630.5	5.4
3	0.0	104.8	1394	17.1	.060	.4	0.0	14.57	193.6	2.4
4	0.0	101.3	1581	43.3	.050	.8	0.0	6.33	98.8	2.7
5	0.0	102.0	1838	77.7	.030	.7	0.0	4.64	83.6	3.5
6	0.0	101.3	1854	399.7	.060	2.6	0.0	2.30	42.1	9.1
7	0.0	169.9	3745	739.4	0.000	0.0	0.0	2.57	56.7	11.2
8	0.0	184.7	3951	864.3	.040	2.9	0.0	2.57	54.9	12.0
9	0.0	193.0	3610	1138.6	0.000	0.0	0.0	2.39	44.7	14.1
10	0.0	365.5	12176	469.2	0.000	0.0	0.0	4.15	138.4	5.3
11	0.0	235.0	1237	3.0	.070	0.0	I	R	R	R
12	0.0	876.9	1088	1.2	.120	0.0	I	R	R	R
13	0.0	460.0	20466	985.9	.025	4.0	0.0	2.90	129.0	6.2
14	0.0	285.5	10476	1558.1	.055	8.0	0.0	1.46	71.9	10.7
15	0.0	241.4	8961	1383.0	.035	4.6	0.0	1.85	68.8	10.6
16	0.0	227.9	8400	1238.6	.060	7.1	0.0	1.92	70.7	10.4
17	0.0	1.1	1358	862.5	.060	4.8	0.0	.01	17.0	10.8
18	0.0	10.2	865	256.9	0.000	0.0	0.0	.26	21.7	6.4
19	0.0	12.9	1096	147.4	.065	1.8	0.0	.45	38.6	5.2
20	0.0	45.5	1614	67.0	0.000	0.0	0.0	3.49	123.7	5.1
21	0.0	48.2	1788	39.0	0.000	0.0	0.0	15.72	583.4	12.7
22	0.0	196.4	1106	3.7	.080	0.0	I	R	R	R
23	0.0	248.4	182	3.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.510	GRAM/BHP HR
	CO	79.751	GRAM/BHP HR
	NO2	9.522	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.671	LB/BHP HR

APPENDIX I

TASK 9 - ENGINE 9

MASS EMISSION RESULTS BY:
NINE-MODE FTP
NINE-MODE EPA
AND 23-MODE PROCEDURES

TABLE I-1. COMPOSITE EMISSIONS FOR ENGINE 9

				Composite Emissions, Gram/Bhp Hr					Cycle BSFC
				HC		CO	NO$_2$		
Test	Run	Date	Engine*	NDIR	FID	NDIR	NDIR	CL	lbs/Bhp Hr
NINE MODE FTP									
45	1	7-3	9-0	6.09	8.64	75.7	8.5	7.96	0.721
45	2	7-3	9-0	6.46	8.93	93.5	8.59	7.78	0.721
45	3	7-3	9-0	6.47	9.18	94.4	8.72	7.99	0.721
45	4	7-3	9-0	6.26	8.54	87.4	8.21	7.60	0.721
		AVERAGE		6.32	8.82	87.8	8.51	7.83	0.721
NINE MODE EPA									
46	1	7-5	9-0	5.58	8.35	131.1	6.93	6.40	0.745
46	2	7-5	9-0	5.72	8.59	127.7	7.37	6.94	0.745
46	3	7-5	9-0	5.23	7.76	128.1	7.78	8.19	0.745
46	4	7-5	9-0	5.84	8.47	142.6	7.83	7.52	0.745
		AVERAGE		5.59	8.29	132.3	7.48	7.26	0.745
23-MODE EPA									
47	1	7-6	99-0	----	7.79	161.3	----	4.39	0.749
47	2	7-6	9-0	----	7.00	159.4	----	4.67	0.738
47	3	7-6	9-0	----	6.95	159.8	----	4.51	0.735
		AVERAGE			7.25	160.2		4.52	0.741

* Engine 9-0 - 1973 Federal Standard Configuration (same as 1973 California Configuration)

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                      TABLE I-2.  MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-U   TEST-45  RUN-1   1973 STANDARD ENGINE  07-03-73       K =1.084      HUM =109.8  GR/LB
-----------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL   FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE          HC     CO     CO2     NO     CARBON  CONS.     HC      CO     NO2     FACT.   HC       CO     NO2    HP     VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE        163    .620   12.80   100    13.596   3220     42      297      8     .232     9.7      69     1.8    0     15.5
2 16 MG        79    .400   13.52  1417    14.005  10251     62      591    344     .077     4.8      46    26.5   30     16.0
3 10 MG        62   1.030   12.77  1311    13.867  15468     75     2321    486     .147    11.0     341    71.4   60     10.0
4 16 MG        63    .510   13.54  1479    14.118  10251     49      748    357     .077     3.8      58    27.5   30     16.0
5 19 MG        60    .720   13.48   637    14.265   7620     35      777    113     .057     2.0      44     6.4   13     19.0
6 16 MG        62    .480   13.55  1447    14.097  10251     49      705    349     .077     3.7      54    26.9   30     16.0
7  3 MG       112   5.030   11.19   523    16.391  25855    191    16076    275     .113    21.6    1817    31.0  104      3.0
8 16 MG        58    .460   13.52  1486    14.093  10251     46      678    360     .077     3.5      52    27.7   30     16.0
9 C.T.       3401    .940    8.48   139    13.093   3221    904      467     11     .143   129.2      67     1.6    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        6.2      83     7.2
1 IDLE        163    .620   12.80   100    13.596   3220     42      297      8     .232     9.7      69     1.8    0     15.5
2 16 MG        78    .640   13.50  1532    14.224  10251     61      932    367     .077     4.7      72    28.2   30     16.0
3 10 MG        60   1.070   12.90  1453    14.035  15468     71     2382    532     .147    10.5     350    78.2   60     10.0
4 16 MG        59    .500   13.62  1604    14.184  10251     46      730    385     .077     3.5      56    29.6   30     16.0
5 19 MG        54    .640   13.54   644    14.238   7620     31      692    123     .057     1.8      39     7.0   13     19.0
6 16 MG        63    .410   13.33  1594    13.808  10251     51      615    393     .077     3.9      47    30.3   30     16.0
7  3 MG        97   4.130   11.50   552    15.735  25855    172    13708    301     .113    19.5    1549    34.0  104      3.0
8 16 MG        56    .420   12.70  1529    13.260  10251     47      656    392     .077     3.6      51    30.2   30     16.0
9 C.T.       3408    .910    8.54   105    13.131   3221    903      451      9     .143   129.1      64     1.2    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        6.1      75     7.9
1 IDLE        145    .660   12.94   140    13.757   3220     37      312     11     .232     8.5      72     2.5    0     15.5
2 16 MG        67    .460   13.58  1496    14.112  10251     53      675    361     .077     4.0      52    27.8   30     16.0
3 10 MG        57   1.030   12.98  1461    14.072  15468     68     2287    533     .147     9.9     336    78.4   60     10.0
4 16 MG        62    .640   13.64  1604    14.347  10251     48      924    380     .077     3.7      71    29.3   30     16.0
5 19 MG        55    .630   13.65   684    14.339   7620     32      676    121     .057     1.8      39     6.9   13     19.0
6 16 MG        61    .520   13.61  1612    14.196  10251     48      759    386     .077     3.7      58    29.8   30     16.0
7  3 MG       100   3.890   11.68   593    15.678  25855    178    12959    325     .113    20.1    1464    36.7  104      3.0
8 16 MG        56    .430   12.29  1512    12.780  10251     49      697    403     .077     3.7      54    31.0   30     16.0
9 C.T.       3413    .910    8.51   119    13.106   3221    906      452     10     .143   129.5      65     1.4    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        6.1      72     8.0
1 IDLE        145    .660   12.94   140    13.757   3220     37      312     11     .232     8.5      72     2.5    0     15.5
2 16 MG        71    .490   13.60  1564    14.167  10251     55      716    376     .077     4.3      55    28.9   30     16.0
3 10 MG        58   1.010   13.01  1520    14.083  15468     69     2241    554     .147    10.1     329    81.5   60     10.0
4 16 MG        64    .610   13.61  1604    14.289  10251     50      884    382     .077     3.8      68    29.4   30     16.0
5 19 MG        54    .620   13.67   701    14.348   7620     31      665    124     .057     1.8      38     7.0   13     19.0
6 16 MG        62    .620   13.63  1611    14.317  10251     48      897    383     .077     3.7      69    29.5   30     16.0
7  3 MG       102   4.180   11.56   607    15.850  25855    180    13773    329     .113    20.3    1556    37.1  104      3.0
8 16 MG        77    .420   13.54  1616    14.093  10251     61      619    392     .077     4.7      48    30.2   30     16.0
9 C.T.       3368    .900    8.52   154    13.057   3221    897      448     13     .143   128.3      64     1.8    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        6.1      75     8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------        6.1      79     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------        6.1      74     8.0
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(     6.1) + 0.65(     6.1) =     6.087   GM/BHP HR
                                        CO- NDIR 0.35(    79.2) + 0.65(    73.8) =    75.670   GM/BHP HR
                                        NO2-NDIR 0.35(     7.5) + 0.65(     8.0) =     7.866   GM/BHP HR
                                                             CORRECTED NO2 =     8.531   GM/BHP HR
                                                                      BSFC =      .721   LB/BHP HR
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              CONCENTRATION AS MEASURED     TOTAL   FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE          HC-FID  CO     CO2    NO-CL   CARBON  CONS.     HC      CO     NO2     FACT.   HC-FID   CO   NO2-CL  HP     VAC.
-----------------------------------------------------------------------------------------------------------
1 IDLE        2951   .620   12.80     50    13.715   3220     69      294      4     .232    16.1      68      .9    0     15.5
2 16 MG       1467   .400   13.52   1300    14.067  10251    107      589    315     .077     8.2      45    24.2   30     16.0
3 10 MG       1015  1.030   12.77   1287    13.901  15468    113     2315    475     .147    16.6     340    69.9   60     10.0
4 16 MG       1271   .510   13.54   1400    14.177  10251     92      745    336     .077     7.1      57    25.9   30     16.0
5 19 MG       1244   .720   13.48    575    14.324   7620     66      774    102     .057     3.8      44     5.8   13     19.0
6 16 MG       1271   .480   13.55   1400    14.157  10251     92      702    337     .077     7.1      54    25.9   30     16.0
7  3 MG       2358  5.030   11.19    487    16.956  25855    370    15964    254     .113    41.9    1804    28.7  104      3.0
8 16 MG       1101   .460   13.52   1425    14.090  10251     80      676    344     .077     6.2      52    26.5   30     16.0
9 C.T.       46529   .940    8.48     38    14.073   3221   1065      435      3     .143   152.3      62      .4    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        8.5      83     6.8
1 IDLE        2951   .620   12.80     50    13.715   3220     69      294      4     .232    16.1      68      .9    0     15.5
2 16 MG       1498   .640   13.50   1412    14.290  10251    107      927    336     .077     8.3      71    25.9   30     16.0
3 10 MG       1129  1.070   12.90   1400    14.083  15468    124     2374    511     .147    18.2     349    75.0   60     10.0
4 16 MG       1215   .500   13.62   1600    14.292  10251     87      727    382     .077     6.7      56    29.4   30     16.0
5 19 MG       1154   .640   13.54    662    14.296   7620     62      689    117     .057     3.5      39     6.7   13     19.0
6 16 MG       1296   .410   13.33   1575    13.870  10251     96      612    386     .077     7.4      47    29.8   30     16.0
7  3 MG       2375  4.130   11.50    475    15.867  25855    387    13594    257     .113    43.7    1536    29.0  104      3.0
8 16 MG       1094   .420   12.70   1537    13.309  10251     84      653    393     .077     6.5      50    30.3   30     16.0
9 C.T.       47411   .910    8.54     37    14.191   3221   1076      417      3     .143   153.9      60      .4    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        8.6      74     7.4
1 IDLE        3518   .660   12.94     62    13.952   3220     81      308      5     .232    18.8      71     1.1    0     15.5
2 16 MG       1525   .460   13.58   1375    14.193  10251    110      671    330     .077     8.5      52    25.4   30     16.0
3 10 MG       1130  1.030   12.98   1400    14.123  15468    124     2279    509     .147    18.2     335    74.8   60     10.0
4 16 MG       1443   .640   13.64   1500    14.424  10251    103      919    354     .077     7.9      71    27.3   30     16.0
5 19 MG       1217   .630   13.65    625    14.402   7620     64      673    110     .057     3.7      38     6.3   13     19.0
6 16 MG       1272   .520   13.61   1537    14.257  10251     91      755    367     .077     7.0      58    28.3   30     16.0
7  3 MG       2317  3.890   11.68    500    15.802  25855    379    12857    272     .113    42.8    1453    30.7  104      3.0
8 16 MG       1090   .430   12.29   1537    12.829  10251     87      694    408     .077     6.7      53    31.4   30     16.0
9 C.T.       46095   .910    8.51     37    14.029   3221   1058      422      3     .143   151.3      60      .4    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        8.7      72     7.4
1 IDLE        3518   .660   12.94     62    13.952   3220     81      308      5     .232    18.8      71     1.1    0     15.5
2 16 MG       1526   .490   13.60   1500    14.293  10251    110      712    358     .077     8.5      55    27.6   30     16.0
3 10 MG       1130  1.010   13.01   1437    14.133  15468    124     2233    522     .147    18.2     328    76.8   60     10.0
4 16 MG       1386   .610   13.61   1575    14.359  10251     99      880    373     .077     7.6      68    28.7   30     16.0
5 19 MG       1160   .620   13.67    637    14.406   7620     61      662    112     .057     3.5      38     6.4   13     19.0
6 16 MG       1386   .620   13.63   1575    14.389  10251     99      892    373     .077     7.6      69    28.7   30     16.0
7  3 MG       2377  4.180   11.56    512    15.978  25855    385    13663    275     .113    43.5    1544    31.1  104      3.0
8 16 MG       1016   .420   13.54   1575    14.062  10251     74      618    381     .077     5.7      48    29.4   30     16.0
9 C.T.       46529   .900    8.52     38    14.073   3221   1065      416      3     .143   152.3      60      .4    0     23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------        8.7      75     7.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------        8.6      79     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------        8.7      73     7.5
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(     8.6) + 0.65(     8.7) =     8.635   GM/BHP HR
                                        CO- NDIR 0.35(    78.6) + 0.65(    73.1) =    75.016   GM/BHP HR
                                        NO2-CL   0.35(     7.1) + 0.65(     7.5) =     7.336   GM/BHP HR
                                                             CORRECTED NO2 =     7.955   GM/BHP HR
                                                                      BSFC =      .721   LB/BHP HR
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                       TABLE I-1   MASS EMISSIONS BY NINE-MODE FTP
ENGINE 440   TEST-45  RUN-2   1973 STANDARD ENGINE  07-03-74     K =1.070     HUM =101.9  GR/LB
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          CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE       HC      CO     CO2     NO   CARBON   CONS.      HC      CO     NO2   FACT.    HC      CO    NO2    HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE    183    .880   11.59    100   12.668    3220      50     452      8    .232    11.7    105    2.0     0    15.5
2 16 MG    65    .470   12.17   1303   12.710   10251      57     766    349    .077     4.4     59   26.9    30    16.0
3 10 MG    58   1.190   11.65   1299   12.903   15468      75    2882    517    .147    11.0    424   76.0    60    10.0
4 16 MG    59    .640   12.25   1503   12.954   10251      50    1023    395    .077     3.9     79   30.4    30    16.0
5 19 MG    53    .780   12.17    636   13.007    7620      34     923    124    .057     1.9     53    7.1    13    19.0
6 16 MG    57    .530   12.06   1515   12.652   10251      50     867    408    .077     3.8     67   31.4    30    16.0
7  3 MG    98   4.770   10.29    585   15.166   25855     180   16427    331    .113    20.4   1856   37.4   104     3.0
8 16 MG    74    .570   12.16   1489   12.810   10251      64     921    396    .077     4.9     71   30.5    30    16.0
9 C.T.   3577   1.080    7.52    117   12.463    3221     999     564     10    .143   142.8     81    1.4     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.7     91    7.9
1 IDLE    183    .880   11.59    100   12.668    3220      50     452      8    .232    11.7    105    2.0     0    15.5
2 16 MG    66    .520   12.00   1362   12.591   10251      58     855    368    .077     4.5     66   28.3    30    16.0
3 10 MG    60   1.260   11.53   1363   12.855   15468      78    3063    544    .147    11.5    450   80.0    60    10.0
4 16 MG    60    .660   12.04   1492   12.765   10251      52    1071    398    .077     4.0     82   30.6    30    16.0
5 19 MG    53    .740   12.14    574   12.937    7620      34     880    112    .057     1.9     50    6.4    13    19.0
6 16 MG    65    .740   12.06   1481   12.870   10251      56    1191    392    .077     4.3     92   30.2    30    16.0
7  3 MG   104   5.160   10.05    530   15.322   25855     190   17588    297    .113    21.4   1987   33.6   104     3.0
8 16 MG    54    .530   12.11   1494   12.698   10251      47     864    400    .077     3.6     67   30.8    30    16.0
9 C.T.   3908   1.080    7.67    141   12.931    3221     954     565     12    .143   136.4     81    1.7     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.5     97    8.0
1 IDLE    152    .850   11.63    126   12.644    3220      42     437     11    .232     9.7    101    2.5     0    15.5
2 16 MG    65    .440   11.97   1370   12.480   10251      57     730    374    .077     4.4     56   28.8    30    16.0
3 10 MG    56   1.160   11.52   1330   12.740   15468      73    2845    536    .147    10.8    418   78.8    60    10.0
4 16 MG    59    .630   12.11   1466   12.804   10251      51    1019    390    .077     3.9     78   30.0    30    16.0
5 19 MG    51    .700   12.08    608   12.835    7620      33     839    120    .057     1.9     48    6.8    13    19.0
6 16 MG    62    .640   12.11   1475   12.817   10251      54    1034    392    .077     4.1     80   30.2    30    16.0
7  3 MG    99   4.640   10.32    605   15.067   25855     183   16084    345    .113    20.7   1817   38.9   104     3.0
8 16 MG    63    .730   12.42   1449   13.218   10251      53    1144    373    .077     4.1     88   28.7    30    16.0
9 C.T.   3425   1.030    7.84    147   12.569    3221     948     533     13    .143   135.6     76    1.8     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.4     90    8.1
1 IDLE    152    .850   11.63    126   12.644    3220      42     437     11    .232     9.7    101    2.5     0    15.5
2 16 MG    73    .660   12.26   1537   12.999   10251      62    1051    402    .077     4.8     81   31.0    30    16.0
3 10 MG    58   1.180   11.66   1377   12.903   15468      75    2858    548    .147    11.0    420   80.6    60    10.0
4 16 MG    66    .780   12.29   1481   13.141   10251      56    1229    384    .077     4.3     95   29.5    30    16.0
5 19 MG    55    .740   12.27    632   13.069    7620      35     872    122    .057     2.0     50    7.0    13    19.0
6 16 MG    67    .780   12.28   1489   13.132   10251      56    1230    386    .077     4.3     95   29.7    30    16.0
7  3 MG   101   5.000   10.28    561   15.389   25855     183   16969    313    .113    20.7   1917   35.4   104     3.0
8 16 MG    62    .700   12.32   1490   13.087   10251      52    1108    387    .077     4.0     85   29.8    30    16.0
9 C.T.   3405   1.080    7.83    110   12.587    3221     941     558      9    .143   134.6     80    1.3     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     6.4     96    8.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     6.6     94    8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     6.4     93    8.1
FOUR CYCLE COMPOSITE -
                                   HC- NDIR 0.35(     6.6) + 0.65(     6.4) =    6.463   GM/BHP HR
                                   CO- NDIR 0.35(    94.4) + 0.65(    93.0) =   93.482   GM/BHP HR
                                   NO2-NDIR 0.35(     8.0) + 0.65(     8.1) =    8.027   GM/BHP HR
                                                      CORRECTED NO2 =    8.587   GM/BHP HR
                                                               BSFC =     .721   LB/BHP HR


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          CONCENTRATION AS MEASURED    TOTAL    FUEL       CALCULATED GM/HR       WT.       WEIGHTED GM/HR          MAN.
MODE      HC-FID   CO     CO2  NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID    CO  NO2-CL   HP    VAC.
----------------------------------------------------------------------------------------------------------------------
1 IDLE   3625    .880   11.59     50   12.832    3220      91     446      4    .232    21.1    103    1.0     0    15.5
2 16 MG  1117    .470   12.17   1237   12.752   10251      90     763    330    .077     6.9     59   25.4    30    16.0
3 10 MG   974   1.190   11.65   1162   12.938   15468     117    2874    461    .147    17.2    422   67.8    60    10.0
4 16 MG  1203    .640   12.25   1437   13.010   10251      95    1019    376    .077     7.3     78   28.9    30    16.0
5 19 MG  1036    .780   12.17    575   13.054    7620      60     920    111    .057     3.4     52    6.4    13    19.0
6 16 MG  1116    .530   12.06   1425   12.702   10251      90     864    382    .077     6.9     67   29.4    30    16.0
7  3 MG  2136   4.770   10.29    525   15.274   25855     362   16311    295    .113    40.9   1843   33.3   104     3.0
8 16 MG   978    .570   12.16   1425   12.828   10251      78     920    378    .077     6.0     71   29.1    30    16.0
9 C.T.  45341   1.080    7.52     37   13.134    3221    1112     535      3    .143   159.0     77     .4     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     8.8     91    7.3
1 IDLE   3625    .880   11.59     50   12.832    3220      91     446      4    .232    21.1    103    1.0     0    15.5
2 16 MG  1339    .520   12.00   1287   12.654   10251     108     851    346    .077     8.4     66   26.7    30    16.0
3 10 MG  1062   1.260   11.53   1225   12.896   15468     127    3053    488    .147    18.7    449   71.7    60    10.0
4 16 MG  1313    .660   12.04   1425   12.831   10251     105    1065    378    .077     8.1     82   29.1    30    16.0
5 19 MG  1035    .740   12.14    525   12.984    7620      61     877    102    .057     3.5     50    5.8    13    19.0
6 16 MG  1370    .740   12.06   1400   12.937   10251     109    1184    368    .077     8.4     91   28.4    30    16.0
7  3 MG  2224   5.160   10.05    437   15.432   25855     373   17463    243    .113    42.1   1973   27.5   104     3.0
8 16 MG   977    .530   12.11   1412   12.738   10251      79     862    377    .077     6.1     66   29.0    30    16.0
9 C.T.  44967   1.080    7.67     37   13.247    3221    1093     530      3    .143   156.4     76     .4     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     8.9     97    7.2
1 IDLE   3402    .850   11.63     62   12.820    3220      85     431      5    .232    19.8    100    1.2     0    15.5
2 16 MG  1282    .440   11.97   1300   12.538   10251     105     727    353    .077     8.1     56   27.2    30    16.0
3 10 MG  1033   1.160   11.52   1262   12.783   15468     125    2835    507    .147    18.4    417   74.5    60    10.0
4 16 MG  1286    .630   12.11   1387   12.869   10251     102    1014    367    .077     7.9     78   28.2    30    16.0
5 19 MG  1006    .700   12.08    550   12.881    7620      60     837    108    .057     3.4     48    6.2    13    19.0
6 16 MG  1314    .640   12.11   1400   12.881   10251     105    1029    370    .077     8.0     79   28.5    30    16.0
7  3 MG  2248   4.640   10.32    512   15.185   25855     383   15959    289    .113    43.3   1803   32.7   104     3.0
8 16 MG  1346    .730   12.42   1362   13.285   10251     104    1138    349    .077     8.0     88   26.9    30    16.0
9 C.T.  45446   1.030    7.84     37   13.415    3221    1091     500      3    .143   156.0     71     .4     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     8.9     90    7.4
1 IDLE   3402    .850   11.63     62   12.820    3220      85     431      5    .232    19.8    100    1.2     0    15.5
2 16 MG  1399    .660   12.26   1425   13.060   10251     110    1046    371    .077     8.5     81   28.6    30    16.0
3 10 MG  1091   1.180   11.66   1250   12.949   15468     130    2847    496    .147    19.2    419   72.9    60    10.0
4 16 MG  1485    .780   12.29   1400   13.219   10251     115    1222    360    .077     8.9     94   27.8    30    16.0
5 19 MG  1092    .740   12.27    562   13.119    7620      63     868    108    .057     3.6     49    6.2    13    19.0
6 16 MG  1429    .780   12.28   1412   13.203   10251     111    1223    364    .077     8.5     94   28.0    30    16.0
7  3 MG  2226   5.000   10.28    450   15.503   25855     371   16845    249    .113    41.9   1903   28.2   104     3.0
8 16 MG  1345    .700   12.32   1387   13.154   10251     105    1102    359    .077     8.1     85   27.6    30    16.0
9 C.T.  46327   1.080    7.83     37   13.543    3221    1102     519      3    .143   157.6     74     .4     0    23.3
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     9.0     95    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     8.9     94    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     9.0     92    7.3
FOUR CYCLE COMPOSITE -
                                   HC- FID  0.35(     8.9) + 0.65(     9.0) =    8.932   GM/BHP HR
                                   CO- NDIR 0.35(    93.7) + 0.65(    92.2) =   92.718   GM/BHP HR
                                   NO2-CL   0.35(     7.2) + 0.65(     7.3) =    7.272   GM/BHP HR
                                                      CORRECTED NO2 =    7.779   GM/BHP HR
                                                               BSFC =     .721   LB/BHP HR
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                    TABLE I-4   MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-D   TEST-45  RUN-3   1973 STANDARD ENGINE  07-03-73      K =1.068      HUM =101.1  GR/LB
------------------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE          HC       CO     CO2     NO    CARBON    CONS.     HC      CO     NO2    FACT.    HC        CO     NO2    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE       177     .640   11.16     90    11.991    3220      51     347       8    .232    11.9       81     1.9     0   15.5
2 16 MG       64     .430   11.78   1341    12.279   10251      58     725     372    .077     4.4       56    28.6    30   16.0
3 10 MG       56    1.010   11.23   1250    12.300   15468      76    2566     522    .147    11.2      377    76.7    60   10.0
4 16 MG       62     .630   11.82   1461    12.517   10251      55    1042     397    .077     4.2       80    30.6    30   16.0
5 19 MG       59     .570   11.70    592    12.334    7620      39     711     121    .057     2.2       41     6.9    13   19.0
6 16 MG       64     .610   11.73   1455    12.409   10251      57    1018     399    .077     4.4       78    30.7    30   16.0
7  3 MG      104    4.700   10.02    599    14.832   25855     196   16549     344    .113    22.1     1870    38.8   104    3.0
8 16 MG       55     .460   11.87   1538    12.389   10251      49     769     422    .077     3.8       59    32.5    30   16.0
9 C.T.      3432    1.020    7.49    130    12.217    3221     977     543      11    .143   139.7       78     1.6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.7       89     8.1
1 IDLE       177     .640   11.16     90    11.991    3220      51     347       8    .232    11.9       81     1.9     0   15.5
2 16 MG       67     .530   11.73   1423    12.332   10251      60     890     393    .077     4.6       69    30.2    30   16.0
3 10 MG       55    1.010   11.09   1232    12.159   15468      76    2596     520    .147    11.1      382    76.5    60   10.0
4 16 MG       55     .500   11.70   1438    12.259   10251      50     845     399    .077     3.8       65    30.7    30   16.0
5 19 MG       53     .680   11.71    639    12.447    7620      35     841     130    .057     2.0       48     7.4    13   19.0
6 16 MG       57     .510   11.70   1449    12.272   10251      51     861     402    .077     4.0       66    30.9    30   16.0
7  3 MG      105    5.380    9.64    469    15.133   25855     194   18567     263    .113    21.9     2098    29.7   104    3.0
8 16 MG       53     .490   11.73   1459    12.277   10251      48     826     403    .077     3.7       64    31.0    30   16.0
9 C.T.      3366    1.070    7.52    125    12.225    3221     958     569      11    .143   137.0       81     1.6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.5       97     7.8
1 IDLE       154     .500   10.70    119    11.366    3220      47     286      11    .232    10.9       66     2.5     0   15.5
2 16 MG       63     .410   11.62   1453    12.098   10251      58     702     409    .077     4.4       54    31.5    30   16.0
3 10 MG       58    1.080   11.16   1358    12.303   15468      79    2743     567    .147    11.6      403    83.3    60   10.0
4 16 MG       67     .710   11.69   1492    12.472   10251      59    1179     407    .077     4.6       91    31.3    30   16.0
5 19 MG       55     .700   11.69    644    12.449    7620      36     868     131    .057     2.1       49     7.5    13   19.0
6 16 MG       66     .810   11.65   1508    12.531   10251      58    1338     410    .077     4.5      103    31.5    30   16.0
7  3 MG      103    5.190    9.70    497    15.001   25855     192   18069     284    .113    21.7     2042    32.1   104    3.0
8 16 MG       67     .500   11.68   1481    12.252   10251      61     845     411    .077     4.7       65    31.7    30   16.0
9 C.T.      3315    1.040    7.54    105    12.160    3221     948     556       9    .143   135.6       80     1.3     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.5       97     8.3
1 IDLE       154     .500   10.70    119    11.366    3220      47     286      11    .232    10.9       66     2.5     0   15.5
2 16 MG       51     .410   10.91   1442    11.375   10251      50     746     431    .077     3.8       57    33.2    30   16.0
3 10 MG       54     .880   11.28   1328    12.218   15468      74    2250     558    .147    10.9      331    82.0    60   10.0
4 16 MG       62     .650   11.66   1442    12.377   10251      55    1087     397    .077     4.3       84    30.5    30   16.0
5 19 MG       52     .670   11.54    622    12.266    7620      35     841     128    .057     2.0       48     7.3    13   19.0
6 16 MG       60     .600   11.66   1505    12.325   10251      54    1008     416    .077     4.2       78    32.0    30   16.0
7  3 MG      100    5.220    9.63    492    14.958   25855     187   18226     282    .113    21.1     2060    31.9   104    3.0
8 16 MG       55     .530   11.54   1456    12.129   10251      50     905     409    .077     3.9       70    31.5    30   16.0
9 C.T.      3165    1.040    7.64    118    12.098    3221     910     559      10    .143   130.1       80     1.5     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     6.2       94     8.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     6.6       93     8.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     6.4       95     8.3
FOUR CYCLE COMPOSITE -
                                           HC- NDIR 0.35(     6.6) + 0.65(     6.4) =     6.469   GM/BHP HR
                                           CO- NDIR 0.35(    92.7) + 0.65(    95.3) =    94.380   GM/BHP HR
                                           NO2-NDIR 0.35(     8.0) + 0.65(     8.3) =     8.164   GM/BHP HR
                                                                 CORRECTED NO2 =     8.722   GM/BHP HR
                                                                          BSFC =      .721   LB/BHP HR


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              CONCENTRATION AS MEASURED     TOTAL     FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE        HC-FID     CO     CO2   NO-CL   CARBON    CONS.     HC      CO     NO2    FACT.  HC-FID      CO  NO2-CL    HP    VAC.
------------------------------------------------------------------------------------------------------------------------
1 IDLE      3882     .640   11.16     50    12.188    3220     103     342       4    .232    23.8       79     1.0     0   15.5
2 16 MG     1363     .430   11.78   1250    12.346   10251     113     721     345    .077     8.7       56    26.5    30   16.0
3 10 MG      974    1.010   11.23   1175    12.337   15468     122    2558     489    .147    18.0      376    71.9    60   10.0
4 16 MG     1282     .630   11.82   1375    12.578   10251     105    1037     372    .077     8.0       80    28.6    30   16.0
5 19 MG      974     .570   11.70    525    12.367    7620      60     709     107    .057     3.4       40     6.1    13   19.0
6 16 MG     1337     .610   11.73   1362    12.474   10251     110    1013     372    .077     8.5       78    28.6    30   16.0
7  3 MG     2216    4.700   10.02    512    14.942   25855     383   16424     294    .113    43.3     1856    33.2   104    3.0
8 16 MG     1003     .460   11.87   1462    12.430   10251      83     766     400    .077     6.4       59    30.8    30   16.0
9 C.T.     45738    1.020    7.49     37    13.084    3221    1126     507       3    .143   161.0       73      .4     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.2       88     7.4
1 IDLE      3882     .640   11.16     50    12.188    3220     103     342       4    .232    23.8       79     1.0     0   15.5
2 16 MG     1392     .530   11.73   1337    12.399   10251     115     885     367    .077     8.9       68    28.3    30   16.0
3 10 MG      973    1.010   11.09   1175    12.197   15468     123    2587     495    .147    18.1      380    72.7    60   10.0
4 16 MG     1085     .500   11.70   1375    12.309   10251      90     841     380    .077     7.0       65    29.3    30   16.0
5 19 MG     1031     .680   11.71    587    12.493    7620      63     838     119    .057     3.6       48     6.8    13   19.0
6 16 MG     1196     .510   11.70   1375    12.330   10251      99     857     380    .077     7.7       66    29.2    30   16.0
7  3 MG     2306    5.380    9.64    387    15.251   25855     391   18425     218    .113    44.2     2082    24.6   104    3.0
8 16 MG     1002     .490   11.73   1362    12.320   10251      83     824     376    .077     6.4       63    29.0    30   16.0
9 C.T.     46201    1.070    7.52     28    13.210    3221    1127     527       2    .143   161.1       75      .3     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.2       96     7.2
1 IDLE      3532     .500   10.70     63    11.553    3220      98     281       6    .232    22.8       65     1.4     0   15.5
2 16 MG     1250     .410   11.62   1350    12.155   10251     105     698     378    .077     8.1       54    29.1    30   16.0
3 10 MG     1002    1.080   11.16   1225    12.340   15468     126    2736     510    .147    18.5      402    74.9    60   10.0
4 16 MG     1393     .710   11.69   1412    12.539   10251     114    1172     383    .077     8.8       90    29.5    30   16.0
5 19 MG     1087     .700   11.69    587    12.499    7620      66     862     119    .057     3.8       49     6.8    13   19.0
6 16 MG     1416     .810   11.65   1425    12.602   10251     115    1331     385    .077     8.9      102    29.6    30   16.0
7  3 MG     2275    5.190    9.70    425    15.118   25855     389   17930     241    .113    44.0     2026    27.3   104    3.0
8 16 MG     1001     .500   11.68   1375    12.280   10251      84     843     381    .077     6.4       65    29.3    30   16.0
9 C.T.     45765    1.040    7.54     38    13.157    3221    1120     514       3    .143   160.2       74      .4     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.2       96     7.5
1 IDLE      3532     .500   10.70     63    11.553    3220      98     281       6    .232    22.8       65     1.4     0   15.5
2 16 MG     1574     .410   10.91   1362    11.477   10251     141     740     404    .077    10.8       57    31.1    30   16.0
3 10 MG      973     .880   11.28   1287    12.257   15468     123    2243     539    .147    18.1      330    79.3    60   10.0
4 16 MG     1364     .650   11.66   1375    12.446   10251     112    1081     376    .077     8.7       83    29.0    30   16.0
5 19 MG     1029     .670   11.54    562    12.313    7620      64     838     115    .057     3.6       48     6.6    13   19.0
6 16 MG     1364     .600   11.66   1437    12.396   10251     113    1002     395    .077     8.7       77    30.4    30   16.0
7  3 MG     2275    5.220    9.63    400    15.077   25855     390   18082     228    .113    44.1     2043    25.7   104    3.0
8 16 MG     1056     .530   11.54   1307    12.176   10251      89     901     388    .077     6.8       69    29.9    30   16.0
9 C.T.     44508    1.040    7.64     38    13.131    3221    1092     515       3    .143   156.1       74      .4     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------------     9.1       93     7.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-----------------------------------     9.2       92     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-----------------------------------     9.2       94     7.6
FOUR CYCLE COMPOSITE -
                                           HC- FID  0.35(     9.2) + 0.65(     9.2) =     9.179   GM/BHP HR
                                           CO- NDIR 0.35(    91.9) + 0.65(    94.4) =    93.545   GM/BHP HR
                                           NO2-CL   0.35(     7.3) + 0.65(     7.6) =     7.476   GM/BHP HR
                                                                 CORRECTED NO2 =     7.987   GM/BHP HR
                                                                          BSFC =      .721   LB/BHP HR
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                  TABLE I-5   MASS EMISSIONS BY NINE-MODE FTP
ENGINE 4-0   TEST 45  RUN-4   1973 STANDARD ENGINE  07-03-73      K =1.084      HUM =104.8  GR/LB
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR          MAN.
MODE         HC      CO    CO2      NO   CARBON   CONS.      HC      CO     NO2   FACT.   HC        CO    NO2    HP   VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE      161    .750  12.01     107   12.934    3220      43     377       9   .232    10.0      88    2.1     0   15.5
2 16 MG      70    .930  12.39    1401   12.896   10251      60     690     370   .077     4.6      53   28.5    30   16.0
3 10 MG      56   1.030  12.12    1206   13.210   15468      71    2436     469   .147    10.4     358   68.9    60   10.0
4 16 MG      56    .520  12.77    1354   13.350   10251      46     807     345   .077     3.6      62   26.6    30   16.0
5 19 MG      53    .700  12.77     556   13.627    7620      32     797     104   .057     1.8      45    5.9    13   19.0
6 16 MG      58    .620  12.69    1446   13.373   10251      48     960     368   .077     3.7      74   28.3    30   16.0
7  3 MG     101   4.730  10.79     544   15.629   25855     180   15806     299   .113    20.4    1786   33.8   104    3.0
8 16 MG      56    .450  12.78    1424   13.290   10251      47     701     365   .077     3.6      54   28.1    30   16.0
9 C.T.     3484   1.030   7.91     120   12.703    3221     954     528      10   .143   136.4      75    1.4     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     6.4      85    7.3
1 IDLE      161    .750  12.01     107   12.934    3220      43     377       9   .232    10.0      88    2.1     0   15.5
2 16 MG      66    .530  12.60    1354   13.201   10251      55     831     349   .077     4.3      64   26.9    30   16.0
3 10 MG      57   1.050  12.03    1241   13.192   15468      72    2496     485   .147    10.7     367   71.3    60   10.0
4 16 MG      60    .550  12.71    1448   13.325   10251      50     855     370   .077     3.8      66   28.5    30   16.0
5 19 MG      52    .670  12.71     543   13.436    7620      32     768     112   .057     1.8      44    6.4    13   19.0
6 16 MG      58    .520  12.75    1441   13.333   10251      48     808     368   .077     3.7      62   28.3    30   16.0
7  3 MG     101   4.460  10.66     535   15.729   25855     179   16469     292   .113    20.3    1861   33.0   104    3.0
8 16 MG      63    .660  12.75    1470   13.478   10251      52    1014     371   .077     4.0      78   28.6    30   16.0
9 C.T.     3386   1.050   8.03     130   12.737    3221     926     536      11   .143   132.2      77    1.6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     6.2      88    7.4
1 IDLE      160    .850  12.01     117   13.033    3220      43     424      10   .232     9.9      98    2.2     0   15.5
2 16 MG      69    .470  12.68    1374   13.195   10251      58     738     354   .077     4.5      57   27.3    30   16.0
3 10 MG      56   1.080  12.09    1261   13.230   15468      71    2551     489   .147    10.4     375   71.9    60   10.0
4 16 MG      57    .580  12.74    1454   13.382   10251      47     898     371   .077     3.6      69   28.6    30   16.0
5 19 MG      57    .770  12.68     671   13.512    7620      35     877     126   .057     2.0      50    7.2    13   19.0
6 16 MG      60    .580  12.71    1509   13.355   10251      50     899     385   .077     3.8      69   29.6    30   16.0
7  3 MG      99   4.690  10.73     557   15.527   25855     178   15776     308   .113    20.1    1783   34.8   104    3.0
8 16 MG      63    .660  12.68    1497   13.408   10251      52    1014     380   .077     4.0      78   29.3    30   16.0
9 C.T.     3379   1.010   8.08     129   12.679    3221     927     518      10   .143   132.6      74    1.5     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     6.2      87    7.6
1 IDLE      160    .850  12.01     117   13.033    3220      43     424      10   .232     9.9      98    2.2     0   15.5
2 16 MG      70    .570  12.69    1439   13.336   10251      58     885     366   .077     4.5      68   28.2    30   16.0
3 10 MG      59   1.120  12.01    1349   13.194   15468      75    2652     525   .147    11.0     390   77.2    60   10.0
4 16 MG      62    .630  12.73    1474   13.427   10251      51     972     375   .077     3.9      75   28.9    30   16.0
5 19 MG      60    .770  12.65     571   13.485    7620      37     879     107   .057     2.1      50    6.1    13   19.0
6 16 MG      61    .530  12.72    1516   13.316   10251      51     824     387   .077     3.9      63   29.8    30   16.0
7  3 MG     103   4.790  10.67     572   15.571   25855     185   16066     315   .113    20.9    1815   35.6   104    3.0
8 16 MG      66    .700  12.69    1458   13.461   10251      54    1077     369   .077     4.2      83   28.4    30   16.0
9 C.T.     3326   1.030   8.08     129   12.702    3221     911     528      11   .143   130.3      75    1.6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     6.2      89    7.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     6.3      87    7.4
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     6.2      88    7.7
FOUR CYCLE COMPOSITE -                 HC- NDIR 0.35(     6.3) + 0.65(     6.2) =    6.260   GM/BHP HR
                                       CO- NDIR 0.35(    86.7) + 0.65(    87.8) =   87.433   GM/BHP HR
                                       NO2-NDIR 0.35(     7.4) + 0.65(     7.7) =    7.574   GM/BHP HR
                                                            CORRECTED NO2 =    8.214   GM/BHP HR
                                                                     BSFC =     .721   LB/BHP HR
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            CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR           MAN.
MODE       HC-FID    CO    CO2   NO-CL   CARBON   CONS.      HC      CO     NO2   FACT.  HC-FID     CO  NO2-CL  HP   VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE     3214    .750  12.01      50   13.081    3220      79     373       4   .232    18.4      87     .9     0   15.5
2 16 MG    1175    .930  12.39    1300   12.937   10251      93     688     342   .077     7.2      53   26.3    30   16.0
3 10 MG     841   1.030  12.12    1125   13.234   15468      98    2432     437   .147    14.5     357   64.2    60   10.0
4 16 MG    1011    .520  12.77    1275   13.391   10251      77     804     324   .077     6.0      62   25.0    30   16.0
5 19 MG    1040    .700  12.77     512   13.574    7620      58     794      96   .057     3.3      45    5.4    13   19.0
6 16 MG    1179    .620  12.69    1363   13.428   10251      90     956     345   .077     6.9      74   26.6    30   16.0
7  3 MG    2287   4.730  10.79     488   15.744   25855     375   15686     266   .113    42.4    1773   30.1   104    3.0
8 16 MG     926    .450  12.78    1350   13.323   10251      71     699     345   .077     5.5      54   26.6    30   16.0
9 C.T.    48505   1.030   7.91      50   13.790    3221    1133     486       4   .143   162.0      69     .6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     8.7      84    6.7
1 IDLE     3214    .750  12.01      50   13.081    3220      79     373       4   .232    18.4      87     .9     0   15.5
2 16 MG    1121    .530  12.60    1275   13.242   10251      87     829     328   .077     6.7      64   25.2    30   16.0
3 10 MG     953   1.050  12.03    1175   13.175   15468     112    2490     458   .147    16.4     366   67.3    60   10.0
4 16 MG    1235    .550  12.71    1375   13.303   10251      95     851     350   .077     7.3      66   26.9    30   16.0
5 19 MG     927    .670  12.71     543   13.473    7620      52     765     102   .057     3.0      44    5.8    13   19.0
6 16 MG    1106    .520  12.75    1363   13.381   10251      85     805     347   .077     6.5      62   26.7    30   16.0
7  3 MG    2144   4.460  10.66     450   15.835   25855     350   16360     244   .113    39.6    1849   27.6   104    3.0
8 16 MG    1265    .660  12.75    1400   13.536   10251      96    1010     352   .077     7.4      78   27.1    30   16.0
9 C.T.    45094   1.050   8.03      50   13.589    3221    1069     503       4   .143   152.8      72     .6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     8.4      88    6.8
1 IDLE     3581    .850  12.01      63   13.218    3220      87     418       5   .232    20.2      97    1.2     0   15.5
2 16 MG    1346    .470  12.65    1300   13.255   10251     104     734     334   .077     8.0      57   25.7    30   16.0
3 10 MG     926   1.080  12.09    1225   13.263   15468     108    2544     474   .147    15.9     374   69.7    60   10.0
4 16 MG    1151    .580  12.74    1388   13.435   10251      88     894     352   .077     6.8      69   27.1    30   16.0
5 19 MG    1124    .770  12.68     625   13.562    7620      63     874     117   .057     3.6      50    6.6    13   19.0
6 16 MG    1207    .580  12.71    1450   13.411   10251      92     896     368   .077     7.1      69   28.3    30   16.0
7  3 MG    2114   4.690  10.73     475   15.631   25855     350   15670     261   .113    39.5    1771   29.5   104    3.0
8 16 MG    1277    .660  12.68    1412   13.468   10251      97    1018     357   .077     7.5      78   27.5    30   16.0
9 C.T.    43341   1.010   8.02      50   13.364    3221    1045     492       4   .143   149.4      70     .6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     8.4      86    7.1
1 IDLE     3581    .850  12.01      63   13.218    3220      87     418       5   .232    20.2      97    1.2     0   15.5
2 16 MG    1375    .570  12.69    1375   13.398   10251     105     881     349   .077     8.1      68   26.9    30   16.0
3 10 MG    1037   1.120  12.01    1288   13.234   15468     121    2644     500   .147    17.8     389   73.5    60   10.0
4 16 MG    1320    .630  12.73    1412   13.492   10251     100     967     356   .077     7.7      74   27.4    30   16.0
5 19 MG    1265    .770  12.65     525   13.546    7620      71     875      98   .057     4.1      50    5.6    13   19.0
6 16 MG    1263    .530  12.72    1438   13.376   10251      97     820     366   .077     7.5      63   28.2    30   16.0
7  3 MG    2200   4.790  10.67     475   15.680   25855     363   15955     260   .113    41.0    1803   29.4   104    3.0
8 16 MG    1321    .700  12.69    1413   13.522   10251     100    1072     356   .077     7.7      83   27.4    30   16.0
9 C.T.    43804   1.030   8.08      50   13.490    3221    1046     497       4   .143   149.6      71     .6     0   23.3
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------------     8.6      88    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------------     8.6      86    6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------------     8.5      87    7.1
FOUR CYCLE COMPOSITE -                 HC- FID  0.35(     8.6) + 0.65(     8.5) =    8.543   GM/BHP HR
                                       CO- NDIR 0.35(    86.0) + 0.65(    87.2) =   86.760   GM/BHP HR
                                       NO2-CL   0.35(     6.8) + 0.65(     7.1) =    7.004   GM/BHP HR
                                                            CORRECTED NO2 =    7.596   GM/BHP HR
                                                                     BSFC =     .721   LB/BHP HR
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                        TABLE 1-6   MASS EMISSIONS BY NINE-MODE EPA
ENGINE-4-0    TEST-46  RUN-1   1973 STANDARD ENGINE  07-05-73      K =1.107      HUM =127.2  GR/LB
------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE           HC      CO     CO2      NO   CARBON   CONS.      HC       CO     NO2   FACT.     HC       CO    NO2    HP   VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE         138    .420   13.18     96   13.749    3130      34      193      7   .232      7.9      45    1.7     0   15.7
2 30 PCT T     107    .410   13.87   1470   14.396   10796      87      621    366   .077      6.7      48   28.2    35   15.3
3 60 PCT T      60   1.390   13.09    987   14.545   18870      84     3643    425   .147     12.4     535   62.5    70    7.5
4 30 PCT T      60    .510   13.74   1467   14.315   10796      49      777    367   .077      3.8      60   28.3    35   15.3
5 10 PCT T      50    .790   13.76    447   14.604    7757      29      848     79   .057      1.6      48    4.5    12   19.3
6 30 PCT T      60    .600   13.75   1559   14.415   10796      49      908    388   .077      3.7      70   29.8    30   15.3
7 90 PCT T     121   7.900    9.79    244   17.821   31162     229    27905    142   .113     25.8    3153   16.0   106    2.4
8 30 PCT T      59    .570   13.85   1517   14.484   10796      47      858    375   .077      3.7      66   28.9    30   15.3
9 C.T.        3536   1.010    8.35     72   13.179    2999     868      463      5   .143    124.1      66     .8     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.7     123    6.0
1 IDLE         138    .420   13.18     96   13.749    3130      34      193      7   .232      7.9      45    1.7     0   15.7
2 30 PCT T      66    .470   13.68   1444   14.221   10796      54      721    364   .077      4.2      55   28.0    35   15.3
3 60 PCT T      58   1.830   13.02    994   14.913   18870      79     4678    418   .147     11.7     688   61.4    70    7.5
4 30 PCT T      60    .650   13.78   1605   14.495   10796      48      978    397   .077      3.7      75   30.6    35   15.3
5 10 PCT T      57   1.090   13.56    584   14.712    7757      32     1161    102   .057      1.9      66    5.8    12   19.3
6 30 PCT T      62    .920   13.61   1499   14.597   10796      50     1374    368   .077      3.8     106   28.3    30   15.3
7 90 PCT T     118   7.690    9.69    231   17.507   31162     227    27649    137   .113     25.6    3124   15.4   106    2.4
8 30 PCT T      60    .760   13.60   1456   14.425   10796      48     1149    362   .077      3.7      88   27.9    30   15.3
9 C.T.        3458   1.030    8.43     89   13.195    2999     847      472      7   .143    121.2      68    1.0     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.5     130    6.0
1 IDLE         150    .820   12.68     95   13.662    3130      37      379      7   .232      8.6      88    1.7     0   15.7
2 30 PCT T      70    .890   13.40   1543   14.366   10796      57     1351    385   .077      4.4     104   29.6    35   15.3
3 60 PCT T      59   1.500   13.15   1149   14.714   18870      82     3886    489   .147     12.0     571   71.9    70    7.5
4 30 PCT T      56    .770   13.63   1491   14.460   10796      45     1161    370   .077      3.5      89   28.5    35   15.3
5 10 PCT T      53    .740   13.61    590   14.407    7757      31      805    105   .057      1.8      46    6.0    12   19.3
6 30 PCT T      69    .840   13.00   1355   13.915   10796      58     1317    349   .077      4.5     101   26.9    30   15.3
7 90 PCT T      99   7.730    9.44    325   17.277   31162     193    28164    195   .113     21.8    3182   22.0   106    2.4
8 30 PCT T      65    .750   11.40   1246   12.220   10796      62     1338    365   .077      4.8     103   28.1    30   15.3
9 C.T.        3482    .980    8.37     66   13.111    2999     859      452      5   .143    122.8      65     .7     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.5     131    6.5
1 IDLE         150    .820   12.68     95   13.662    3130      37      379      7   .232      8.6      88    1.7     0   15.7
2 30 PCT T      72    .860   13.49   1444   14.428   10796      58     1300    359   .077      4.5     100   27.6    35   15.3
3 60 PCT T      56   1.840   12.91   1077   14.810   18870      77     4736    456   .147     11.3     696   67.0    70    7.5
4 30 PCT T      66    .820   13.48   1577   14.371   10796      54     1244    393   .077      4.1      96   30.3    35   15.3
5 10 PCT T      55    .960   13.49    555   14.509    7757      32     1037     99   .057      1.8      59    5.6    12   19.3
6 30 PCT T      68   1.050   13.42   1600   14.543   10796      55     1574    394   .077      4.2     121   30.4    30   15.3
7 90 PCT T     116   7.890    9.73    230   17.745   31162     220    27988    134   .113     24.9    3163   15.2   106    2.4
8 30 PCT T      65    .980   13.17   1517   14.220   10796      53     1503    382   .077      4.1     116   29.4    30   15.3
9 C.T.        3418   1.020    8.33     76   13.041    2999     847      473      6   .143    121.2      68     .8     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     5.6     136    6.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     5.6     127    6.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     5.6     133    6.4
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     5.6) + 0.65(     5.6) =    5.579   GM/BHP HR
                                    CO- NDIR 0.35(   126.7) + 0.65(   133.4) =  131.055   GM/BHP HR
                                    NO2-NDIR 0.35(     6.0) + 0.65(     6.4) =    6.259   GM/BHP HR
                                                          CORRECTED NO2 =    6.927   GM/BHP HR
                                                                   BSFC =     .745   LB/BHP HR


------------------------------------------------------------------------------------------------------------
              CONCENTRATION AS MEASURED    TOTAL    FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR              MAN.
MODE         HC-FID    CO     CO2   NO-CL   CARBON   CONS.      HC       CO     NO2   FACT.   HC-FID     CO  NO2-CL   HP   VAC.
------------------------------------------------------------------------------------------------------------
1 IDLE        3990    .420   13.18     60   13.999    3130      88      190      4   .232     20.4      44    1.0     0   15.7
2 30 PCT T    1500    .410   13.87   1387   14.430   10796     112      620    345   .077      8.6      48   26.5    35   15.3
3 60 PCT T    1134   1.390   13.09    912   14.593   18870     147     3631    392   .147     21.6     534   57.6    70    7.5
4 30 PCT T    1188    .510   13.74   1400   14.369   10796      89      774    349   .077      6.9      60   26.9    35   15.3
5 10 PCT T    1135    .790   13.76    412   14.663    7757      60      844     72   .057      3.4      48    4.1    12   19.3
6 30 PCT T    1331    .600   13.75   1550   14.483   10796      99      903    384   .077      7.6      70   29.5    30   15.3
7 90 PCT T    2560   7.900    9.79    187   17.946   31162     445    27710    108   .113     50.2    3131   12.2   106    2.4
8 30 PCT T    1247    .570   13.85   1462   14.545   10796      93      855    360   .077      7.1      66   27.7    30   15.3
9 C.T.       46071   1.010    8.35     37   13.967    2999     988      437      3   .143    141.2      63     .4     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     8.0     122    5.6
1 IDLE        3990    .420   13.18     60   13.999    3130      88      190      4   .232     20.4      44    1.0     0   15.7
2 30 PCT T    1498    .470   13.68   1375   14.300   10796     113      717    345   .077      8.7      55   26.5    35   15.3
3 60 PCT T    1280   1.830   13.02    937   14.978   18870     161     4657    392   .147     23.7     685   57.6    70    7.5
4 30 PCT T    1417    .650   13.78   1562   14.572   10796     105      973    384   .077      8.1      75   29.6    35   15.3
5 10 PCT T    1363   1.090   13.56    550   14.786    7757      71     1155     96   .057      4.1      66    5.5    12   19.3
6 30 PCT T    1446    .920   13.61   1437   14.675   10796     106     1367    351   .077      8.2     105   27.0    30   15.3
7 90 PCT T    2612   7.690    9.69    175   17.641   31162     461    27439    103   .113     52.1    3101   11.6   106    2.4
8 30 PCT T    1388    .760   13.60   1375   14.499   10796     103     1143    340   .077      8.0      88   26.2    30   15.3
9 C.T.       46545   1.030    8.43     37   14.115    2999     987      441      3   .143    141.2      63     .4     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     8.3     129    5.6
1 IDLE        3853    .820   12.68     62   13.885    3130      87      373      5   .232     20.1      87    1.1     0   15.7
2 30 PCT T    1528    .890   13.40   1450   14.443   10796     114     1344    360   .077      8.8     103   27.7    35   15.3
3 60 PCT T    1277   1.500   13.15   1012   14.778   18870     163     3869    429   .147     24.0     569   63.1    70    7.5
4 30 PCT T    1360    .770   13.63   1450   14.536   10796     101     1155    358   .077      7.8      89   27.5    35   15.3
5 10 PCT T    1218    .740   13.61    475   14.472    7757      65      801     85   .057      3.7      46    4.8    12   19.3
6 30 PCT T    1636    .840   13.00   1387   14.004   10796     126     1308    355   .077      9.7     101   27.3    30   15.3
7 90 PCT T    2665   7.730    9.44    187   17.437   31162     476    27906    111   .113     53.8    3153   12.5   106    2.4
8 30 PCT T    1557    .750   11.40   1450   12.306   10796     137     1329    422   .077     10.5     102   32.5    30   15.3
9 C.T.       45632    .980    8.37     37   13.913    2999     982      426      3   .143    140.4      61     .4     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     8.4     130    5.9
1 IDLE        3853    .820   12.68     62   13.885    3130      87      373      5   .232     20.1      87    1.1     0   15.7
2 30 PCT T    1812    .860   13.49   1387   14.531   10796     135     1291    342   .077     10.4      99   26.3    35   15.3
3 60 PCT T    1278   1.840   12.91   1012   14.878   18870     162     4714    426   .147     23.8     693   62.6    70    7.5
4 30 PCT T    1670    .820   13.48   1512   14.467   10796     125     1236    375   .077      9.6      95   28.8    35   15.3
5 10 PCT T    1360    .960   13.49    525   14.586    7757      72     1031     93   .057      4.1      59    5.3    12   19.3
6 30 PCT T    1587   1.050   13.42   1537   14.629   10796     117     1565    377   .077      9.0     121   29.0    30   15.3
7 90 PCT T    2675   7.890    9.73    187   17.887   31162     466    27765    108   .113     52.7    3137   12.2   106    2.4
8 30 PCT T    1583    .980   13.17   1437   14.308   10796     119     1494    360   .077      9.2     115   27.7    30   15.3
9 C.T.       46936   1.020    8.33     37   14.044    2999    1001      439      3   .143    143.1      63     .4     0   23.2
----------------CYCLE COMPOSITE IN GM/BHP HR-------------------------------------     8.5     135    5.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)-------------------------------     8.2     126    5.6
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)-------------------------------     8.5     132    5.9
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     8.2) + 0.65(     8.5) =    8.349   GM/BHP HR
                                    CO- NDIR 0.35(   125.7) + 0.65(   132.3) =  129.960   GM/BHP HR
                                    NO2-CL   0.35(     5.6) + 0.65(     5.9) =    5.782   GM/BHP HR
                                                          CORRECTED NO2 =    6.399   GM/BHP HR
                                                                   BSFC =     .745   LB/BHP HR
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                      TABLE I 7.  MASS EMISSIONS BY NINE-MODE EPA
ENGINE 4-D   TEST 46  RUN-2   1973 STANDARD ENGINE  02-05-73      K =1.103      HUM =123.3  GR/LB
-----------------------------------------------------------------------------------------------------------------
                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE            HC      CO     CO2     NO      CARBON   CONS.     HC      CO     NO2    FACT.     HC       CO     NO2    HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE          183    .700   12.59     85     13.488    3130     46     328      7     .232     10.6      76     1.5     0   15.7
2 30 PCT T       65    .360   13.29   1408     13.720   10796     55     572    368     .077      4.3      44    28.3    35   15.3
3 60 PCT T       51   1.480   12.72    945     14.255   18870     73    3957    437     .147     10.7     582    64.3    70    7.5
4 30 PCT T       56    .530   13.29   1529     13.880   10796     47     833    394     .077      3.6      64    30.3    35   15.3
5 10 PCT T       51    .770   13.14    526     13.965    7757     31     864     97     .057      1.7      49     5.5    12   19.3
6 30 PCT T       56    .530   13.29   1544     13.880   10796     47     833    399     .077      3.6      64    30.7    30   15.2
7 90 PCT T      112   7.580    9.55    251     17.251   31162    219   27659    151     .113     24.7    3125    17.0   106    2.9
8 30 PCT T       56    .450   13.20   1584     13.710   10796     48     716    414     .077      3.7      55    31.9    30   15.3
9 C.T.         3682    .930    8.13     85     13.037    2999    913     431      6     .143    130.6      62      .9     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    5.8     124     6.3
1 IDLE          183    .700   12.59     85     13.488    3130     46     328      7     .232     10.6      76     1.5     0   15.7
2 30 PCT T       61    .330   13.07   1485     13.466   10796     53     534    395     .077      4.1      41    30.4    35   15.3
3 60 PCT T       51   1.520   12.59   1097     14.165   18870     73    4090    485     .147     10.8     601    71.3    70    7.5
4 30 PCT T       61    .590   13.00   1584     13.656   10796     52     942    416     .077      4.0      73    32.0    35   15.3
5 10 PCT T       51    .820   13.00    644     13.875    7757     31     926    120     .057      1.8      53     6.8    12   19.3
6 30 PCT T       56    .550   13.14   1524     13.750   10796     47     872    397     .077      3.7      67    30.6    30   15.3
7 90 PCT T      117   7.500    9.44    264     17.066   31162    231   27663    160     .113     26.1    3126    18.1   106    2.9
8 30 PCT T       61    .610   13.14   1625     13.816   10796     51     963    422     .077      4.0      74    32.5    30   15.3
9 C.T.         3538    .920    8.32     85     13.061    2999    876     426      6     .143    125.3      61      .9     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    5.7     126     6.8
1 IDLE          183    .700   12.31     96     13.208    3130     47     335      8     .232     10.9      78     1.8     0   15.7
2 30 PCT T       65    .450   13.00   1504     13.520   10796     56     726    399     .077      4.3      56    30.7    35   15.3
3 60 PCT T       51   1.590   12.45   1046     14.095   18870     74    4300    465     .147     10.8     632    68.3    70    7.5
4 30 PCT T       61    .610   12.72   1564     13.396   10796     53     993    418     .077      4.1      76    32.2    35   15.3
5 10 PCT T       56    .890   13.00    555     13.950    7757     34    1000    102     .057      1.9      57     5.8    12   19.3
6 30 PCT T       61    .670   13.00   1584     13.736   10796     52    1064    413     .077      4.0      82    31.8    30   15.3
7 90 PCT T      112   7.660    9.33    251     17.111   31162    220   28179    151     .113     24.9    3184    17.1   106    2.9
8 30 PCT T       61    .650   13.00   1584     13.716   10796     52    1033    414     .077      4.0      80    31.9    30   15.3
9 C.T.         3442    .890    8.42     47     13.027    2999    854     413      7     .143    122.2      59     1.0     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    5.6     130     6.7
1 IDLE          183    .700   12.31     96     13.208    3130     47     335      8     .232     10.9      78     1.8     0   15.7
2 30 PCT T       70    .610   13.14   1564     13.826   10796     59     962    405     .077      4.5      74    31.2    35   15.3
3 60 PCT T       56   1.560   12.54   1115     14.160   18870     81    4199    493     .147     11.8     617    72.5    70    7.5
4 30 PCT T       61    .630   13.00   1604     13.696   10796     52    1003    420     .077      4.0      77    32.3    35   15.3
5 10 PCT T       47    .780   13.00    526     13.831    7757     28     884     98     .057      1.6      50     5.6    12   19.3
6 30 PCT T       56    .610   13.00   1645     13.670   10796     48     973    431     .077      3.7      75    33.2    30   15.3
7 90 PCT T      112   7.580    9.33    251     17.031   31162    221   28016    152     .113     25.0    3166    17.2   106    2.9
8 30 PCT T       56    .580   13.00   1604     13.640   10796     48     927    421     .077      3.7      71    32.5    30   15.3
9 C.T.         3538    .920    8.32     86     13.061    2999    876     426      7     .143    125.3      61      .9     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    5.7     129     6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    5.8     125     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    5.7     129     6.7
FOUR CYCLE COMPOSITE -
                                    HC- NDIR 0.35(     5.8) + 0.65(     5.7) =     5.721   GM/BHP HR
                                    CO- NDIR 0.35(   124.9) + 0.65(   129.2) =   127.687   GM/BHP HR
                                    NO2-NDIR 0.35(     6.5) + 0.65(     6.7) =     6.679   GM/BHP HR
                                                           CORRECTED NO2 =     7.366   GM/BHP HR
                                                                    BSFC =      .745   LB/BHP HR
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                CONCENTRATION AS MEASURED      TOTAL    FUEL      CALCULATED GM/HR       WT.        WEIGHTED GM/HR              MAN.
MODE          HC-FID    CO     CO2   NO-CL     CARBON   CONS.     HC      CO     NO2    FACT.   HC-FID     CO   NO2-CL   HP    VAC.
-----------------------------------------------------------------------------------------------------------------
1 IDLE         4660    .700   12.59     50     13.756    3130    106     322      4     .232     24.6      75      .9     0   15.7
2 30 PCT T     1633    .360   13.29   1350     13.813   10796    128     568    350     .077      9.8      44    27.0    35   15.3
3 60 PCT T     1216   1.480   12.72    925     14.322   18870    160    3939    405     .147     23.6     579    59.5    70    7.5
4 30 PCT T     1466    .530   13.29   1475     13.967   10796    113     828    379     .077      8.7      64    29.1    35   15.3
5 10 PCT T     1270    .770   13.14    500     14.037    7757     70     860     92     .057      4.0      49     5.2    12   19.3
6 30 PCT T     1466    .530   13.29   1500     13.967   10796    113     828    385     .077      8.7      64    29.6    30   15.2
7 90 PCT T     2607   7.580    9.55    188     17.391   31162    467   27437    112     .113     52.8    3100    12.6   106    2.9
8 30 PCT T     1352    .450   13.20   1538     13.785   10796    106     712    400     .077      8.2      55    30.8    30   15.3
9 C.T.        47687    .930    8.13     50     13.829    2999   1032     407      4     .143    147.6      58      .5     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    8.7     123     5.9
1 IDLE         4660    .700   12.59     50     13.756    3130    106     322      4     .232     24.6      75      .9     0   15.7
2 30 PCT T     1489    .330   13.07   1437     13.549   10796    119     531    380     .077      9.1      41    29.3    35   15.3
3 60 PCT T     1244   1.520   12.59   1050     14.234   18870    165    4070    462     .147     24.2     598    67.9    70    7.5
4 30 PCT T     1589    .590   13.00   1550     13.749   10796    125     936    404     .077      9.6      72    31.1    35   15.3
5 10 PCT T     1382    .820   13.00    612     13.958    7757     77     921    113     .057      4.4      52     6.4    12   19.3
6 30 PCT T     1521    .550   13.14   1500     13.842   10796    119     867    388     .077      9.1      67    29.9    30   15.3
7 90 PCT T     2834   7.500    9.44    200     17.223   31162    513   27411    120     .113     57.9    3097    13.6   106    2.9
8 30 PCT T     1606    .610   13.14   1587     13.911   10796    125     956    409     .077      9.6      74    31.5    30   15.3
9 C.T.        49932    .920    8.32     47     14.233    2999   1050     391      3     .143    150.2      56      .5     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    9.0     124     6.4
1 IDLE         3529    .700   12.31     63     13.363    3130     83     331      5     .232     19.2      77     1.1     0   15.7
2 30 PCT T     1546    .450   13.00   1462     13.605   10796    123     721    385     .077      9.4      56    29.7    35   15.3
3 60 PCT T     1215   1.590   12.45   1000     14.161   18870    162    4280    442     .147     23.8     629    65.0    70    7.5
4 30 PCT T     1545    .610   12.72   1525     13.484   10796    124     987    405     .077      9.5      76    31.2    35   15.3
5 10 PCT T     1382    .890   13.00    512     14.028    7757     76     994     94     .057      4.4      57     5.4    12   19.3
6 30 PCT T     1532    .670   13.00   1550     13.823   10796    120    1057    402     .077      9.2      81    30.9    30   15.3
7 90 PCT T     2633   7.660    9.33    192     17.253   31162    475   27947    115     .113     53.7    3158    13.0   106    2.9
8 30 PCT T     1436    .650   13.00   1538     13.794   10796    112    1028    400     .077      8.7      79    30.8    30   15.3
9 C.T.        45617    .890    8.42     38     13.872    2999    985     388      3     .143    140.8      55      .4     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    8.4     129     6.3
1 IDLE         3529    .700   12.31     63     13.363    3130     83     331      5     .232     19.2      77     1.1     0   15.7
2 30 PCT T     1641    .610   13.14   1525     13.914   10796    131     956    393     .077     10.1      74    30.2    35   15.3
3 60 PCT T     1215   1.560   12.54   1087     14.222   18870    161    4181    479     .147     23.7     615    70.4    70    7.5
4 30 PCT T     1520    .630   13.00   1587     13.782   10796    119     997    413     .077      9.2      77    31.8    35   15.3
5 10 PCT T     1156    .780   13.00    488     13.896    7757     65     880     90     .057      3.7      50     5.2    12   19.3
6 30 PCT T     1436    .610   13.00   1612     13.754   10796    113     967    420     .077      8.7      74    32.3    30   15.3
7 90 PCT T     2631   7.580    9.33    188     17.173   31162    477   27784    113     .113     53.9    3140    12.8   106    2.9
8 30 PCT T     1379    .580   13.00   1575     13.718   10796    109     922    412     .077      8.4      71    31.7    30   15.3
9 C.T.        47761    .920    8.32     37     14.016    2999   1020     397      3     .143    145.9      57      .4     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR--------------------------------------    8.5     128     6.5
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)------------------------------    8.8     124     6.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)------------------------------    8.5     128     6.4
FOUR CYCLE COMPOSITE -
                                    HC- FID  0.35(     8.8) + 0.65(     8.5) =     8.591   GM/BHP HR
                                    CO- NDIR 0.35(   123.8) + 0.65(   128.1) =   126.591   GM/BHP HR
                                    NO2-CL   0.35(     6.1) + 0.65(     6.4) =     6.289   GM/BHP HR
                                                           CORRECTED NO2 =     6.936   GM/BHP HR
                                                                    BSFC =      .745   LB/BHP HR
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                    TABLE I-8.  MASS EMISSIONS BY NINE-MODE EPA
ENGINE-4-U    TEST 46  RUN-3   1973 STANDARD ENGINE  07-05-73       K =1.097      HUM =118.6  GR/LB
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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE            HC      CO     CO2     NO    CARBON    CONS.      HC      CO     NO2    FACT.    HC      CO     NO2    HP    VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE          150    .750  13.01     58   13.922    3130       36     341       4   .232     8.4     79    1.0     0   15.7
2 30 PCT T       70    .550  13.78   1613   14.906   10796       57     833     401   .077     4.4     64   30.9    35   15.3
3 60 PCT T       58   1.790  13.24   1252   15.093   18870       78    4521     520   .147    11.5    665   76.4    70    7.5
4 30 PCT T       50    .770  13.73   1704   14.554   10796       40    1154     420   .077     3.1     89   32.3    35   15.3
5 10 PCT T       39    .900  13.66    541   14.602    7757       22     966      95   .057     1.3     55    5.4    12   19.3
6 30 PCT T       45    .630  13.75   1732   14.429   10796       36     952     430   .077     2.8     73   33.1    30   15.3
7 90 PCT T      115   8.570  10.00    248   18.694   31162      207   28857     137   .113    23.4   3261   15.5   106    2.9
8 30 PCT T       54    .740  14.00   1720   14.798   10796       43    1091     417   .077     3.3     84   32.1    30   15.3
9 C.T.         3456   1.340   8.83     99   13.902    2999      804     583       7   .143   114.9     83    1.0     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.2    134    6.9
1 IDLE          150    .750  13.01     58   13.922    3130       36     341       4   .232     8.4     79    1.0     0   15.7
2 30 PCT T       65    .280  13.71   1815   14.060   10796       54     434     463   .077     4.2     33   35.6    35   15.3
3 60 PCT T       59   1.790  13.43   1265   15.284   18870       79    4464     519   .147    11.6    656   76.2    70    7.5
4 30 PCT T       57    .710  14.03   1745   14.802   10796       45    1045     423   .077     3.5     81   32.5    35   15.3
5 10 PCT T       48   1.020  13.93    668   15.002    7757       27    1065     115   .057     1.5     61    6.6    12   19.3
6 30 PCT T       62    .490  13.83   1762   14.387   10796       50     743     439   .077     3.9     57   33.8    30   15.3
7 90 PCT T      118   7.200  10.51    236   17.837   31162      223   25408     137   .113    25.2   2871   15.5   106    2.9
8 30 PCT T       73    .990  13.95   1824   15.019   10796       57    1438     435   .077     4.4    111   33.5    30   15.3
9 C.T.         3278   1.360   9.04     98   13.990    2999      760     590       7   .143   108.7     84    1.0     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.2    122    7.1
1 IDLE          148   1.150  13.26     91   14.570    3130       34     499       6   .232     8.0    116    1.5     0   15.7
2 30 PCT T       73   1.090  13.77   1803   14.939   10796       57    1591     433   .077     4.4    123   33.3    35   15.2
3 60 PCT T       58   1.810  13.45   1243   15.323   18870       77    4503     508   .147    11.3    662   74.7    70    7.5
4 30 PCT T       64    .980  13.97   1754   15.019   10796       50    1483     419   .077     3.8    110   32.2    35   15.3
5 10 PCT T       49   1.000  14.02    613   15.073    7757       27    1040     105   .057     1.6     59    6.0    12   19.3
6 30 PCT T       64    .490  13.60   1863   14.159   10796       53     755     472   .077     4.1     58   36.3    30   15.3
7 90 PCT T      117   7.270  10.36    244   17.756   31162      222   25773     142   .113    25.1   2912   16.1   106    2.9
8 30 PCT T       79   1.310  13.39   1816   14.785   10796       62    1932     440   .077     4.8    149   33.9    30   15.3
9 C.T.         3355   1.310   8.95     81   13.883    2999      781     571       6   .143   111.7     82     .8     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.3    129    7.1
1 IDLE          148   1.150  13.26     91   14.570    3130       34     499       6   .232     8.0    116    1.5     0   15.7
2 30 PCT T       72    .760  13.94   1835   14.778   10796       57    1122     445   .077     4.4     86   34.3    35   15.3
3 60 PCT T       58   1.910  13.39   1300   15.363   18870       77    4739     530   .147    11.3    697   77.9    70    7.5
4 30 PCT T       65   1.000  13.96   1843   15.030   10796       50    1451     440   .077     3.9    112   33.8    35   15.3
5 10 PCT T       51   1.020  13.98    665   15.055    7757       28    1062     114   .057     1.6     61    6.5    12   19.3
6 30 PCT T       67    .580  13.93   1829   14.082   10796       55     898     466   .077     4.3     69   35.8    30   15.3
7 90 PCT T      119   7.260  10.90    262   17.789   31162      225   25691     152   .113    25.4   2903   17.2   106    2.9
8 30 PCT T       93   1.020  13.82   1713   14.990   10796       73    1489     411   .077     5.6    115   31.6    30   15.3
9 C.T.         3293   1.310   9.00    107   13.866    2999      768     571       8   .143   109.8     82    1.1     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     5.3    128    7.2
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     5.2    128    7.0
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     5.3    128    7.2
FOUR CYCLE COMPOSITE -              HC- NDIR 0.35(     5.2) + 0.65(     5.3) =    5.233   GM/BHP HR
                                    CO- NDIR 0.35(   127.8) + 0.65(   128.2) =  128.073   GM/BHP HR
                                    NO2-NDIR 0.35(     7.0) + 0.65(     7.2) =    7.092   GM/BHP HR
                                                         CORRECTED NO2 =    7.783   GM/BHP HR
                                                                  BSFC =     .745   LB/BHP HR


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               CONCENTRATION AS MEASURED    TOTAL     FUEL      CALCULATED GM/HR        WT.      WEIGHTED GM/HR            MAN.
MODE          HC-FID    CO     CO2   NO-CL   CARBON    CONS.      HC      CO     NO2    FACT.  HC-FID    CO   NO2-CL  HP    VAC.
---------------------------------------------------------------------------------------------------------------
1 IDLE         3635    .750  13.01     55   14.124    3130       81     336       4   .232    18.7     78     .9     0   15.7
2 30 PCT T     1274    .550  13.78   1600   14.457   10796       95     830     397   .077     7.3     64   30.5    35   15.3
3 60 PCT T     1139   1.790  13.24   1212   15.199   18870      142    4505     501   .147    20.9    662   73.7    70    7.5
4 30 PCT T     1304    .770  13.73   1688   14.630   10796       96    1148     414   .077     7.4     88   31.8    35   15.3
5 10 PCT T      908    .900  13.66    538   14.551    7757       48     963      95   .057     2.7     55    5.4    12   19.3
6 30 PCT T     1105    .630  13.75   1713   14.490   10796       82     948     424   .077     6.3     73   32.6    30   15.3
7 90 PCT T     2695   8.570  10.00    200   18.840   31162      446   28639     110   .113    50.4   3236   12.4   106    2.9
8 30 PCT T     1193    .740  14.00   1700   14.859   10796       87    1086     410   .077     6.7     84   31.6    30   15.3
9 C.T.        42888   1.340   8.83     56   14.459    2999      888     561       4   .143   127.0     80     .6     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     7.5    133    6.6
1 IDLE         3635    .750  13.01     55   14.124    3130       81     336       4   .232    18.7     78     .9     0   15.7
2 30 PCT T     1468    .280  13.71   1788   14.137   10796      112     432     453   .077     8.6     33   34.9    35   15.3
3 60 PCT T     1198   1.790  13.43   1250   15.390   18870      147    4448     511   .147    21.7    654   75.0    70    7.5
4 30 PCT T     1392    .710  14.03   1750   14.879   10796      101    1041     422   .077     7.8     80   32.5    35   15.3
5 10 PCT T     1081   1.020  13.93    675   15.058    7757       56    1061     115   .057     3.2     60    6.6    12   19.3
6 30 PCT T     1387    .490  13.83   1775   14.469   10796      104     739     440   .077     8.0     57   33.9    30   15.3
7 90 PCT T     2764   7.200  10.51    200   17.986   31162      479   25198     115   .113    54.1   2847   13.0   106    2.9
8 30 PCT T     1565    .990  13.95   1800   15.097   10796      112    1430     427   .077     8.6    110   32.9    30   15.3
9 C.T.        44286   1.360   9.04     63   14.829    2999      894     555       4   .143   127.9     79     .6     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     7.8    121    6.9
1 IDLE         3513   1.150  13.26     62   14.761    3130       74     493       4   .232    17.3    114    1.0     0   15.7
2 30 PCT T     1621   1.090  13.77   1800   15.082   10796      116    1582     424   .077     9.0    122   33.1    35   15.2
3 60 PCT T     1170   1.810  13.45   1200   15.377   18870      144    4487     489   .147    21.1    660   71.9    70    7.5
4 30 PCT T     1565    .980  13.97   1738   15.107   10796      118    1415     412   .077     8.6    109   31.8    35   15.3
5 10 PCT T     1110   1.000  14.02    588   15.131    7757       57    1036     100   .057     3.2     59    5.7    12   19.3
6 30 PCT T     1413    .490  13.60   1850   14.231   10796      107     751     466   .077     8.3     58   35.9    30   15.3
7 90 PCT T     2704   7.270  10.36    200   17.900   31162      471   25565     116   .113    53.2   2889   13.1   106    2.9
8 30 PCT T     1562   1.310  13.39   1812   14.856   10796      114    1923     437   .077     8.7    148   33.7    30   15.3
9 C.T.        45110   1.310   8.95     63   14.771    2999      914     536       4   .143   130.8     77     .6     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     7.8    128    6.8
1 IDLE         3513   1.150  13.26     62   14.761    3130       74     493       4   .232    17.3    114    1.0     0   15.7
2 30 PCT T     1647    .760  13.94   1812   14.865   10796      120    1115     437   .077     9.2     86   33.6    35   15.3
3 60 PCT T     1170   1.910  13.39   1263   15.417   18870      143    4722     513   .147    21.1    694   75.4    70    7.5
4 30 PCT T     1514   1.000  13.96   1838   15.111   10796      108    1443     436   .077     8.3    111   33.6    35   15.3
5 10 PCT T     1110   1.020  13.98    625   15.111    7757       57    1058     107   .057     3.2     60    6.1    12   19.3
6 30 PCT T     1447    .580  13.93   1813   14.160   10796      114     893     459   .077     8.8     69   35.3    30   15.3
7 90 PCT T     2734   7.260  10.90   1175   17.933   31162      475   25483     678   .113    53.7   2880   76.6   106    2.9
8 30 PCT T     1535   1.020  13.82   1687   14.994   10796      111    1484     403   .077     8.5    114   31.1    30   15.3
9 C.T.        44691   1.310   9.00     55   14.779    2999      905     536       4   .143   129.5     77     .5     0   23.2
---------------CYCLE COMPOSITE IN GM/BHP HR------------------------------------------     7.8    127    8.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)----------------------------------     7.6    127    6.8
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)----------------------------------     7.8    127    7.8
FOUR CYCLE COMPOSITE -              HC- FID  0.35(     7.6) + 0.65(     7.8) =    7.757   GM/BHP HR
                                    CO- NDIR 0.35(   126.8) + 0.65(   127.1) =  127.039   GM/BHP HR
                                    NO2-CL   0.35(     6.8) + 0.65(     7.8) =    7.463   GM/BHP HR
                                                         CORRECTED NO2 =    8.190   GM/BHP HR
                                                                  BSFC =     .745   LB/BHP HR
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                        TABLE I-9   MASS EMISSIONS BY NINE-MODE EPA
ENGINE 9-0    TEST-46  RUN 4    1973 STANDARD ENGINE  07-05-73      K =1.075      HUM =104.9  GR/LB
--------------------------------------------------------------------------------------------------------------
                  CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE              HC      CO     CO2     NO    CARBON   CONS.        HC       CO     NO2    FACT.    HC         CO     NO2     HP    VAC.
--------------------------------------------------------------------------------------------------------------
1 IDLE           233    .610   11.40     58    12.262    3130        64      315       5    .232     14.9        73     1.1     0    15.7
2 30 PCT T        64    .840   11.85   1970    12.765   10796        63     1436     413    .077      4.9       111    31.8    35    15.3
3 60 PCT T        56   1.610   11.75   1048    13.420   18870        85     4573     489    .147     12.5       672    71.9    70     7.5
4 30 PCT T        65    .860   12.33   1606    13.260   10796        57     1419     434    .077      4.4       109    33.4    35    15.3
5 10 PCT T        55    .880   12.23    615    13.169    7757        35     1047     120    .057      2.0        60     6.9    12    19.3
6 30 PCT T        62    .770   12.35   1686    13.187   10796        55     1273     458    .077      4.2        98    35.3    30    15.3
7 90 PCT T       122   7.440    8.88    238    16.952   31162       242    29484     145    .113     27.4      3332    16.4   106     2.4
8 30 PCT T        65    .860   12.26   1685    13.190   10796        57     1422     458    .077      4.4       109    35.3    30    15.3
9 C.T.          3479   1.080    7.54    110    12.377    2999       909      528       9    .143    130.0        75     1.3     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   6.2       140     7.0
1 IDLE           233    .610   11.40     58    12.262    3130        64      315       5    .232     14.9        73     1.1     0    15.7
2 30 PCT T        93    .660   12.34   1701    13.100   10796        83     1099     465    .077      6.4        85    35.8    35    15.3
3 60 PCT T        70   1.760   11.80   1188    13.636   18870       105     4920     546    .147     15.4       723    80.2    70     7.5
4 30 PCT T        71    .860   12.30   1704    13.237   10796        63     1417     461    .077      4.8       109    35.5    35    15.3
5 10 PCT T        62   1.010   12.27    576    13.347    7757        39     1186     111    .057      2.2        68     6.3    12    19.3
6 30 PCT T        61    .630   12.28   1719    12.976   10796        55     1059     475    .077      4.2        82    36.6    30    15.3
7 90 PCT T       123   8.260    8.77    231    17.163   31162       241    30295     139    .113     27.3      3423    15.7   106     2.4
8 30 PCT T        63    .680   12.34   1685    13.088   10796        56     1133     461    .077      4.3        87    35.5    30    15.3
9 C.T.          3295   1.100    7.76     98    12.419    2999       858      536       8    .143    122.7        77     1.1     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   6.1       142     7.5
1 IDLE           196    .880   11.69     70    12.728    3130        39      437       6    .232      9.0       101     1.3     0    15.7
2 30 PCT T        74    .700   12.31   1634    13.090   10796        66     1166     447    .077      5.1        90    34.5    35    15.3
3 60 PCT T        56   1.700   11.79   1139    13.550   18870        84     4782     527    .147     12.4       703    77.4    70     7.5
4 30 PCT T        63    .820   1 .29   1698    13.178   10796        56     1357     462    .077      4.3       104    35.6    35    15.3
5 10 PCT T        50    .860   12.27    545    13.184    7757        32     1022     106    .057      1.8        58     6.1    12    19.3
6 30 PCT T        62    .790   12.28   1679    13.137   10796        55     1311     458    .077      4.2       101    35.3    30    15.3
7 90 PCT T       120   8.240    8.76    219    17.170   31162       235    30356     132    .113     26.6      3430    14.9   106     2.4
8 30 PCT T        64    .850   12.30   1713    13.219   10796        56     1402     464    .077      4.3       108    35.8    30    15.3
9 C.T.          3233   1.140    7.84    102    12.472    2999       838      553       8    .143    119.9        79     1.2     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   5.7       144     7.3
1 IDLE           196    .880   11.69     70    12.728    3130        39      437       6    .232      9.0       101     1.3     0    15.7
2 30 PCT T        75    .830   12.28   1644    13.191   10796        66     1372     448    .077      5.1       106    34.5    35    15.3
3 60 PCT T        56   1.720   11.72   1151    13.500   18870        85     4856     534    .147     12.4       714    78.5    70     7.5
4 30 PCT T        63    .810   12.32   1665    13.198   10796        56     1338     452    .077      4.3       103    34.8    35    15.3
5 10 PCT T        56   1.040   12.18    507    13.280    7757        35     1227      98    .057      2.0        70     5.6    12    19.3
6 30 PCT T        64    .810   12.30   1645    13.179   10796        57     1340     447    .077      4.4       103    34.4    30    15.3
7 90 PCT T       122   8.020    8.86    223    17.012   31162       241    29676     136    .113     27.3      3353    15.3   106     2.4
8 30 PCT T        67    .900   12.25   1756    13.222   10796        59     1484     476    .077      4.5       114    36.7    30    15.3
9 C.T.          3239   1.100    7.79    102    12.388    2999       845      537       8    .143    120.9        77     1.2     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   5.7       143     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   6.1       141     7.3
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------   5.7       143     7.3
FOUR CYCLE COMPOSITE -                  HC- NDIR 0.35(      6.1) + 0.65(      5.7) =      5.841   GM/BHP HR
                                        CO- NDIR 0.35(    141.1) + 0.65(    143.4) =    142.571   GM/BHP HR
                                        NO2-NDIR 0.35(      7.3) + 0.65(      7.3) =      7.280   GM/BHP HR
                                                               CORRECTED NO2 =      7.826   GM/BHP HR
                                                                        BSFC =       .745   LB/BHP HR


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                  CONCENTRATION AS MEASURED     TOTAL    FUEL        CALCULATED GM/HR        WT.        WEIGHTED GM/HR              MAN.
MODE             HC-FID    CO     CO2  NO-CL   CARBON   CONS.        HC       CO     NO2    FACT.  HC-FID       CO  NO2-CL   HP     AC.
--------------------------------------------------------------------------------------------------------------
1 IDLE          4389    .610   11.40     50    12.449    3130       110      310       4    .232     25.6        72     1.0     0    15.7
2 30 PCT T      1117    .840   11.85   1900    12.802   10796        94     1431     392    .077      7.3       110    30.2    35    15.3
3 60 PCT T       955   1.610   11.75   1000    13.456   18870       134     4561     466    .147     19.7       670    68.4    70     7.5
4 30 PCT T      1374    .860   12.33   1562    13.327   10796       111     1407     420    .077      8.6       108    32.3    35    15.3
5 10 PCT T      1121    .880   12.23    587    13.222    7757        66     1038     114    .057      3.7        59     6.5    12    19.3
6 30 PCT T      1346    .770   12.35   1637    13.265   10796       110     1267     443    .077      8.4        98    34.1    30    15.3
7 90 PCT T      2398   7.440    8.88    200    17.060   31162       438    29299     121    .113     49.5      3311    13.7   106     2.4
8 30 PCT T      1402    .860   12.26   1625    13.260   10796       114     1419     439    .077      8.8       109    33.8    30    15.3
9 C.T.         46645   1.080    7.54     63    13.284    2999      1051      492       5    .143    150.3        70      .7     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   8.5       139     6.7
1 IDLE          4389    .610   11.40     50    12.449    3130       110      310       4    .232     25.6        72     1.0     0    15.7
2 30 PCT T      1652    .660   12.34   1663    13.165   10796       136     1093     453    .077     10.4        84    34.9    35    15.3
3 60 PCT T      1210   1.760   11.80   1150    13.681   18870       167     4904     527    .147     24.5       721    77.4    70     7.5
4 30 PCT T      1458    .860   12.30   1675    13.306   10796       118     1410     451    .077      9.1       109    34.7    35    15.3
5 10 PCT T      1235   1.010   12.27    563    13.404    7757        71     1181     108    .057      4.1        67     6.2    12    19.3
6 30 PCT T      1231    .630   12.28   1700    13.033   10796       102     1054     468    .077      7.9        81    36.0    30    15.3
7 90 PCT T      2518   8.260    8.77    188    17.282   31162       454    30086     113    .113     51.3      3400    12.7   106     2.4
8 30 PCT T      1317    .680   12.34   1650    13.152   10796       108     1128     450    .077      8.3        87    34.6    30    15.3
9 C.T.         45875   1.100    7.76     50    13.447    2999      1021      495       4    .143    146.1        71      .5     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   8.7       141     7.2
1 IDLE          3600    .880   11.69     63    12.930    3130        87      430       5    .232     20.2       100     1.2     0    15.7
2 30 PCT T      1596    .700   12.31   1612    13.170   10796       131     1154     439    .077     10.1        89    33.8    35    15.3
3 60 PCT T      1069   1.700   11.79   1113    13.597   18870       148     4766     513    .147     21.8       701    75.4    70     7.5
4 30 PCT T      1458    .820   12.29   1675    13.256   10796       119     1349     453    .077      9.1       104    34.9    35    15.3
5 10 PCT T      1065    .860   12.27    525    13.237    7757        62     1018     102    .057      3.6        58     5.8    12    19.3
6 30 PCT T      1373    .790   12.28   1637    13.207   10796       112     1304     444    .077      8.6       100    34.2    30    15.3
7 90 PCT T      2518   8.280    8.76    188    17.292   31162       454    30142     112    .113     51.3      3406    12.7   106     2.4
8 30 PCT T      1374    .850   12.30   1675    13.287   10796       112     1398     452    .077      8.6       107    34.8    30    15.3
9 C.T.         45056   1.140    7.84     50    13.486    2999      1000      511       4    .143    143.0        73      .5     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   8.3       143     7.0
1 IDLE          3600    .880   11.69     63    12.930    3130        87      430       5    .232     20.2       100     1.2     0    15.7
2 30 PCT T      1654    .830   12.28   1612    13.275   10796       134     1363     435    .077     10.4       105    33.5    35    15.3
3 60 PCT T      1124   1.720   11.72   1112    13.552   18870       157     4838     514    .147     23.0       711    75.6    70     7.5
4 30 PCT T      1402    .810   12.32   1650    13.270   10796       114     1331     446    .077      8.8       102    34.3    35    15.3
5 10 PCT T      1094   1.040   12.18    475    13.329    7757        64     1228      92    .057      3.6        70     5.2    12    19.3
6 30 PCT T      1446    .810   12.30   1613    13.255   10796       118     1333     436    .077      9.1       103    33.6    30    15.3
7 90 PCT T      2567   8.020    8.86    213    17.137   31162       467    29459     129    .113     52.7      3329    14.5   106     2.4
8 30 PCT T      1486    .900   12.25   1725    13.299   10796       121     1476     465    .077      9.3       114    35.8    30    15.3
9 C.T.         45459   1.100    7.79     60    13.435    2999      1017      498       4    .143    144.8        71      .6     0    23.2
---------------CYCLE COMPOSITE IN GM/BHP HR-----------------------------------------   8.5       142     7.1
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 1 AND 2)---------------------------------   8.6       140     6.9
AVERAGE SUM---(COMPOSITE VALUES FOR CYCLES 3 AND 4)---------------------------------   8.4       142     7.0
FOUR CYCLE COMPOSITE -                  HC- FID  0.35(      8.6) + 0.65(      8.4) =      8.468   GM/BHP HR
                                        CO- NDIR 0.35(    140.1) + 0.65(    142.3) =    141.496   GM/BHP HR
                                        NO2-CL   0.35(      6.9) + 0.65(      7.0) =      6.998   GM/BHP HR
                                                               CORRECTED NO2 =      7.522   GM/BHP HR
                                                                        BSFC =       .745   LB/BHP HR
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TABLE I-10 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 9-0 TEST 47 RUN-1 1973 STANDARD ENGINE 07-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	700	0.0	0	15.9	6.9	15.5	0	3644	.520	12.59	45
2	1200	6.6	2	19.1	8.6	15.7	0	3301	.260	12.59	90
3	1200	21.0	5	18.2	11.4	15.5	0	1459	.250	13.00	150
4	1200	47.2	11	16.6	13.1	15.3	0	1333	.280	13.00	325
5	1200	66.9	15	15.7	12.6	15.1	0	1463	.430	13.14	570
6	1200	129.9	30	10.1	19.2	15.2	0	1026	.220	13.29	925
7	1200	195.6	45	3.2	28.6	14.6	0	917	1.230	12.72	887
8	1200	214.0	49	2.9	30.9	13.8	0	1216	2.210	12.59	900
9	1200	242.9	55	1.5	35.7	12.6	0	2238	4.810	11.16	365
10	1200	258.6	59	.1	40.8	12.3	0	2456	6.550	12.59	440
11	700	0.0	0	15.8	6.8	15.5	0	4042	.560	11.04	50
12	1200	0.0	0	20.3	6.9	17.0	0	31801	.400	9.23	10
13	2300	309.8	136	.5	81.0	11.6	0	2033	7.580	9.88	325
14	2300	291.4	128	1.9	83.5	10.8	0	2228	9.830	8.82	160
15	2300	260.0	114	4.3	66.0	12.1	0	1820	6.280	10.56	355
16	2300	235.0	103	5.7	57.7	12.9	0	1559	3.950	11.66	750
17	2300	157.5	69	11.0	37.6	15.0	0	541	.840	12.72	1825
18	2300	78.7	34	16.9	24.1	15.1	0	492	.190	13.14	1812
19	2300	55.1	24	17.6	22.9	14.8	0	556	.460	13.14	1125
20	2300	24.9	11	19.5	18.0	14.7	0	607	.610	13.29	555
21	2300	6.6	3	20.5	16.8	14.7	0	592	.700	13.14	315
22	700	0.0	0	15.9	7.0	15.3	0	2917	.590	12.59	40
23	2300	0.0	0	23.9	6.8	17.1	0	27902	.490	9.23	10

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	84.6	244	3.5	.070	0.0	I	R	R	R
2	0.0	97.7	155	8.8	.060	.1	0.0	64.78	103.1	5.9
3	0.0	56.3	195	19.2	.060	.3	0.0	11.74	40.6	4.0
4	0.0	59.0	251	47.8	.050	.5	0.0	5.47	23.2	4.4
5	0.0	61.0	362	78.9	.030	.5	0.0	3.99	23.7	5.2
6	0.0	65.6	284	196.5	.060	1.8	0.0	2.21	9.6	6.6
7	0.0	84.7	2295	272.1	0.000	0.0	0.0	1.90	51.4	6.1
8	0.0	114.3	4193	280.7	.040	2.0	0.0	2.34	85.8	5.7
9	0.0	223.8	9716	121.2	0.000	0.0	0.0	4.03	175.1	2.2
10	0.0	234.5	12631	139.5	0.000	0.0	0.0	3.97	213.8	2.4
11	0.0	103.4	291	4.3	.070	0.0	I	R	R	R
12	0.0	777.0	197	.8	.120	0.0	I	R	R	R
13	0.0	422.8	31850	224.4	.025	3.4	0.0	3.12	234.8	1.7
14	0.0	447.1	39850	106.6	.055	7.0	0.0	3.50	312.3	.8
15	0.0	320.2	22311	207.3	.035	4.0	0.0	2.81	195.9	1.8
16	0.0	258.8	13246	413.4	.060	6.2	0.0	2.51	128.7	4.0
17	0.0	67.8	2126	759.1	.060	4.1	0.0	.98	30.8	11.0
18	0.0	40.2	314	491.5	0.000	0.0	0.0	1.17	9.1	14.3
19	0.0	42.3	707	284.1	.065	1.6	0.0	1.75	29.3	11.8
20	0.0	35.5	721	107.8	0.000	0.0	0.0	3.26	66.1	9.9
21	0.0	32.5	775	57.3	0.000	0.0	0.0	11.23	268.2	19.8
22	0.0	68.8	281	3.1	.080	0.0	I	R	R	R
23	0.0	687.4	244	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE

HC	7.788	GRAM/BHP HR
CO	161.342	GRAM/BHP HR
NO2	4.394	GRAM/BHP HR
ALDE	0.000	GRAM/BHP HR
BSFC	.749	LB/BHP HR

TABLE I-11 MASS EMISSIONS BY 23 MODE PROCEDURE
ENGINE 9-0 TEST 47 RUN-2 1973 STANDARD ENGINE 07-06-73

		DYNA.		MAN.	FUEL	A/F		DRY CONCENTRATION			
MODE	SPEED	LOAD	HP	VAC.	LB/HR	RATIO	ALDE.	HC	CO	CO2	NO
1	700	0.0	0	16.0	7.1	15.1	0	3431	.780	11.92	40
2	1200	6.6	2	19.1	8.8	15.3	0	2791	.410	12.18	80
3	1200	22.3	5	18.6	10.0	15.1	0	1663	.470	12.31	140
4	1200	48.6	11	17.2	11.6	15.0	0	1486	.520	12.59	285
5	1200	65.6	15	16.1	12.5	14.9	0	1534	.530	12.45	410
6	1200	131.3	30	11.6	18.2	14.9	0	1624	.420	12.59	1112
7	1200	195.6	45	3.4	28.9	14.9	0	882	.990	12.05	825
8	1200	216.6	49	3.1	31.2	14.2	0	1407	1.430	12.18	1037
9	1200	240.2	55	2.0	35.7	12.5	0	2330	4.860	10.68	335
10	1200	261.2	60	.1	40.4	11.8	0	2566	6.910	9.66	430
11	700	0.0	0	16.2	7.0	14.8	0	3190	.990	11.92	40
12	1200	0.0	0	20.4	7.0	15.8	0	23522	.680	11.16	10
13	2300	315.0	138	.5	81.0	11.4	0	2132	8.050	9.33	320
14	2300	290.0	127	2.0	83.5	10.7	0	2439	9.830	8.42	130
15	2300	260.0	114	4.5	67.8	12.1	0	1945	6.080	10.44	370
16	2300	235.0	103	5.9	56.0	13.3	0	1523	3.100	11.92	1000
17	2300	158.8	70	10.8	37.5	15.2	0	532	.720	12.31	1675
18	2300	77.4	34	16.7	24.9	15.0	0	351	.300	12.86	1462
19	2300	55.1	24	17.5	22.3	14.8	0	689	.520	12.86	1112
20	2300	23.6	10	19.6	17.9	14.7	0	654	.680	12.86	495
21	2300	6.6	3	20.4	16.1	14.9	0	549	.550	12.86	300
22	700	0.0	0	16.0	7.0	15.1	0	3583	.630	12.31	40
23	2300	0.0	0	24.0	6.8	17.4	0	26125	.340	9.23	10

	CALCULATED GRAM/HR				WT.	WT.	BRAKE SPECIFIC GRAM/BHP-HR			
MODE	ALDE.	HC	CO	NO2	FAC.	HP	ALDE.	HC	CO	NO2
1	0.0	84.7	389	3.3	.070	0.0	I	R	R	R
2	0.0	86.6	257	8.2	.060	.1	0.0	57.41	170.3	5.5
3	0.0	58.3	333	16.3	.060	.3	0.0	11.43	65.3	3.2
4	0.0	59.0	417	37.6	.050	.6	0.0	5.31	37.5	3.4
5	0.0	66.2	462	58.8	.030	.4	0.0	4.42	30.8	3.9
6	0.0	101.8	532	231.4	.060	1.8	0.0	3.39	17.7	7.7
7	0.0	88.1	1997	273.5	0.000	0.0	0.0	1.97	44.7	6.1
8	0.0	144.8	2973	354.3	.040	2.0	0.0	2.93	60.1	7.2
9	0.0	234.2	10079	114.2	0.000	0.0	0.0	4.36	183.6	2.1
10	0.0	279.5	15202	155.5	0.000	0.0	0.0	4.68	254.7	2.6
11	0.0	76.6	480	3.2	.070	0.0	I	R	R	R
12	0.0	526.3	307	.7	.120	0.0	I	R	R	R
13	0.0	445.3	33959	221.9	.025	3.4	0.0	3.23	246.2	1.6
14	0.0	499.6	40666	88.4	.055	7.0	0.0	3.93	320.2	.7
15	0.0	357.8	22598	226.0	.035	4.0	0.0	3.14	198.5	2.0
16	0.0	254.9	10484	555.8	.060	6.2	0.0	2.48	101.9	5.4
17	0.0	69.2	1891	723.0	.060	4.2	0.0	1.00	27.2	10.4
18	0.0	30.1	519	415.5	0.000	0.0	0.0	.89	15.3	12.3
19	0.0	51.8	790	277.7	.065	1.6	0.0	2.15	32.7	11.5
20	0.0	39.0	820	98.1	0.000	0.0	0.0	3.78	79.3	9.5
21	0.0	29.8	603	54.0	0.000	0.0	0.0	10.29	208.5	18.7
22	0.0	85.6	304	3.2	.080	0.0	I	R	R	R
23	0.0	661.4	174	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE	HC	6.945	GRAM/BHP HR
	CO	159.407	GRAM/BHP HR
	NO2	4.668	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.738	LB/BHP HR

TABLE I-12 MASS EMISSIONS BY 23 MODE PROCEDURE

ENGINE 9-0 TEST 47 RUN-3 1973 STANDARD ENGINE 07-06-73

MODE	SPEED	DYNA. LOAD	HP	MAN. VAC.	FUEL LB/HR	A/F RATIO	ALDE.	DRY CONCENTRATION HC	CO	CO2	NO
1	700	0.0	0	16.1	7.1	15.1	0	3643	.750	12.31	45
2	1200	6.6	2	19.1	8.8	15.6	0	2961	.250	12.45	95
3	1200	22.3	5	18.5	9.8	15.7	0	1551	.230	12.59	140
4	1200	47.3	11	17.0	11.1	15.6	0	1203	.240	12.59	265
5	1200	66.9	15	16.1	12.7	15.4	0	1274	.320	12.72	490
6	1200	131.9	30	11.4	18.4	15.3	0	1358	.190	12.86	1112
7	1200	195.6	45	3.4	27.4	15.0	0	912	.990	12.31	775
8	1200	214.0	49	3.0	29.4	14.3	0	1213	1.410	12.45	987
9	1200	240.3	55	2.3	35.7	12.8	0	2233	4.420	11.28	450
10	1200	266.5	61	.1	41.8	12.0	0	2411	6.550	10.21	480
11	700	0.0	0	16.3	7.0	14.7	0	3395	1.130	12.31	40
12	1200	0.0	0	20.4	6.4	16.3	0	25668	.580	10.92	10
13	2300	315.1	138	.5	81.0	11.3	0	2250	8.220	9.23	320
14	2300	287.5	126	1.9	83.2	10.8	0	2367	9.740	8.52	140
15	2300	260.0	114	4.3	67.9	12.1	0	1713	6.080	10.33	375
16	2300	235.0	103	5.7	56.2	13.1	0	1539	3.460	11.66	950
17	2300	158.8	70	10.8	37.7	15.1	0	504	.730	12.31	1687
18	2300	77.4	34	17.0	23.9	14.9	0	589	.410	12.86	1300
19	2300	56.4	25	18.1	21.7	14.8	0	575	.520	12.86	925
20	2300	24.9	11	19.6	17.4	14.8	0	774	.640	12.86	475
21	2300	7.9	3	20.3	15.9	15.1	0	772	.520	12.72	315
22	700	0.0	0	16.1	7.1	15.0	0	3251	.770	12.31	50
23	2300	0.0	0	23.9	6.7	17.4	0	26171	.340	9.44	10

MODE	CALCULATED GRAM/HR ALDE.	HC	CO	NO2	WT. FAC.	WT. HP	BRAKE SPECIFIC GRAM/BHP-HR ALDE.	HC	CO	NO2
1	0.0	87.4	363	3.6	.070	0.0	I	R	R	R
2	0.0	91.0	155	9.7	.060	.1	0.0	60.31	102.9	6.4
3	0.0	53.2	159	15.9	.060	.3	0.0	10.43	31.2	3.1
4	0.0	46.8	188	34.2	.050	.5	0.0	4.33	17.4	3.2
5	0.0	55.7	283	71.2	.030	.5	0.0	3.65	18.5	4.7
6	0.0	86.0	243	233.7	.060	1.8	0.0	2.87	8.1	7.8
7	0.0	84.6	1856	238.8	0.000	0.0	0.0	1.89	41.5	5.3
8	0.0	115.7	2717	312.6	.040	2.0	0.0	2.37	55.6	6.4
9	0.0	227.1	9080	151.9	0.000	0.0	0.0	4.14	165.4	2.8
10	0.0	268.8	14756	177.7	0.000	0.0	0.0	4.42	242.3	2.9
11	0.0	78.2	526	3.1	.070	0.0	I	R	R	R
12	0.0	571.1	261	.7	.120	0.0	I	R	R	R
13	0.0	467.6	34516	220.8	.025	3.4	0.0	3.39	250.1	1.6
14	0.0	483.0	40143	94.8	.055	6.9	0.0	3.84	318.8	.8
15	0.0	318.1	22813	231.3	.035	4.0	0.0	2.79	200.4	2.0
16	0.0	256.8	11665	526.4	.060	6.2	0.0	2.50	113.3	5.1
17	0.0	65.9	1926	731.7	.060	4.2	0.0	.95	27.7	10.5
18	0.0	47.9	674	351.0	0.000	0.0	0.0	1.41	19.9	10.4
19	0.0	42.1	769	225.0	.065	1.6	0.0	1.71	31.2	9.1
20	0.0	45.0	752	91.7	0.000	0.0	0.0	4.13	68.9	8.4
21	0.0	41.8	569	56.6	0.000	0.0	0.0	12.09	164.4	16.4
22	0.0	78.1	374	4.0	.080	0.0	I	R	R	R
23	0.0	641.6	168	.8	.060	0.0	I	R	R	R

CYCLE COMPOSITE			
	HC	6.954	GRAM/BHP HR
	CO	159.813	GRAM/BHP HR
	NO2	4.506	GRAM/BHP HR
	ALDE	0.000	GRAM/BHP HR
	BSFC	.735	LB/BHP HR

APPENDIX J

Note: No data is enclosed in APPENDIX J

APPENDIX K

SUPPORTING DATA USED IN ECONOMIC EVALUATION

TABLE K-1. "BEST COMBINATION" WITH EGR RELATIVE TO 1972 BASELINE GASOLINE ENGINES

9-Mode FTP

		Emissions, g /bhp-hr					Composite
		HC		CO	NO_2		BSFC,
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
2-00	Baseline	3.7	4.6	22.1	16.5	16.1	0.72
2-1	EGR-Air-Cat	---	---	----	8.6	8.6	0.77
		---	---	----	-48%	-47%	+7%
3-00	Baseline	3.8	4.7	16.6	11.0	11.0	0.62
3-1	EGR-Air-Cat	---	0.3	4.3	4.5	4.2	0.89
		---	-94%	-74%	-59%	-62%	+44%
4-00	Baseline	6.3	8.6	63.2	8.8	8.2	0.71
4-1	EGR-Air-Cat	---	0.7	6.2	5.6	5.2	0.85
		---	-92%	-90%	-36%	-37%	+20%
5-0	Baseline	6.7	10.4	106	10.0	8.8	0.71
5-1	EGR-Air-Cat	---	0.3	2.1	4.0	3.9	0.81
		---	-97%	-98%	-60%	-56%	+14%
Avg. of Avgs.		---	-94%*	-87%*	-51%	-51%	+21%
Composite Averages							
Baseline		5.1	7.9*	.62*	11.6	11.0	.69
EGR-Air-Cat		---	.4*	4.2*	5.7	5.5	.83
		---	-95%*	-93%*	-51%	-50%	+20%
		Use	-95%	-90%	-51%	-51%	+21%

* Engine 2 data omitted because outdated catalysts were used.

TABLE K-1 (Cont'd). "BEST COMBINATION" WITH EGR RELATIVE TO 1972 BASELINE GASOLINE ENGINES

		9-Mode EPA					
		Emissions, g /bhp-hr					Composite
		HC		CO	NO_2		BSFC
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
2-0	Baseline	3.6	4.5	35.4	17.2	17.0	0.63
2-1	EGR-Air-Cat	---	---	----	9.5	9.6	0.71
		---	---	----	-45%	-44%	+13%
3-00	Baseline	3.5	4.5	16.4	11.3	11.1	0.62
3-1	EGR-Air-Cat	---	0.2	2.8	4.0	3.5	0.80
		---	-96%	-83%	-65%	-68%	+29%
4-00	Baseline	5.7	7.9	63.9	8.8	8.4	0.68
4-1	EGR-Air-Cat	---	0.5	3.6	6.2	5.9	0.72
		---	-94%	-94%	-30%	-30%	+6%
5-0	Baseline	6.6	9.4	119	7.7	7.5	0.72
5-1	EGR-Air-Cat	---	0.3	5.6	4.6	4.4	0.72
		---	-97%	-95%	-40%	-41%	0%
Avg. of Avgs.		---	-96%*	-91%*	-45%	-46%	+12%
Composite Averages							
Baseline		4.9	7.3*	67*	11.2*	11.0	.66
EGR-Air-Cat		---	.3*	4*	6.1*	5.9	.74
		---	-96%*	-94%*	-46%	-46%	+12%
		Use	-96%*	-92%*	-46%	-46%	+12%

* Engine 2 data omitted because outdated catalysts were used.

TABLE K-1 (Cont'd). "BEST COMBINATION" WITH EGR RELATIVE TO 1972 BASELINE GASOLINE ENGINES

23-Mode EPA

		Emissions, g /bhp-hr					Composite
		HC		CO	NO_2		BSFC,
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
2-0	Baseline	---	8.1	61	---	12.0	0.69
2-1	EGR-Air-Cat	---	---	---	---	6.5	0.74
		---	---	---	---	-48%	+7%
3-00	Baseline	---	7.9	92	---	5.3	0.67
3-1	EGR-Air-Cat	---	0.6	13.7	---	2.9	0.73
		---	-92%	-85%	---	-45%	+9%
4-00	Baseline	---	8.4	92	---	6.1	0.70
4-1	EGR-Air-Cat	---	0.9	15.1	---	4.5	0.75
		---	-89%	-84%	---	-26%	+7%
5-0	Baseline	---	7.6	78	---	9.7	0.67
5-1	EGR-Air-Cat	---	0.3	33	---	4.9	0.72
		---	-96%	-58%	---	-49%	+7%
Avg. of Avgs.		---	-92%*	-76%*	---	-42%	+7%
Composite Averages							
Baseline		---	8.0*	87*	---	8.3	68
EGR-Air-Cat		---	.6*	21*	---	4.7	.73
		---	-93%*	-76%	---	-43%	+7%
		Use	-92%*	-76%*	---	-42%	+7%

* Engine 2 data omitted because outdated catalysts were used.

TABLE K-2. "BEST COMBINATION" WITH EGR RELATIVE TO 1973 BASELINE GASOLINE ENGINES

9-Mode FTP

		Emissions, g /bhp-hr					Composite BSFC, lbs/bhp-hr
		HC		CO	NO_2		
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	
3-0	1973 Federal	4.2	5.5	38.1	7.2	6.8	0.73
3-1	EGR-Air-Cat	---	0.3	4.3	4.5	4.2	0.89
		---	-95%	-87%	-38%	-38%	+22%
4-00	1973 Federal	6.3	8.6	63.2	8.8	8.2	0.71
4-1	EGR-Air-Cat	---	0.7	6.2	5.6	5.2	0.85
		---	-92%	-90%	-36%	-37%	+20%
5-00	1973 Federal	6.4	10.1	114.0	8.3	6.9	0.73
5-1	EGR-Air-Cat	---	0.3	2.1	4.0	3.9	0.81
		---	-97%	-98%	-52%	-43%	+11%
6-00	1973 Federal	4.2	6.7	63.4	10.0	9.5	0.77
6-0P	EGR-Air-Cat	---	.1	5.2	6.9	6.5	1.11
		---	-99%	-92%	-31%	-32%	+44%
7-00	1973 Federal	4.0	7.0	66.7	14.5	13.5	0.64
7-0P	EGR-Air-Cat	---	.4	8.2	4.4	4.2	0.81
		---	-94%	-88%	-70%	-69%	+26%
Avg. of Avgs.		---	-95%	-91%	-45%	-44%	+25%
Composite Averages							
Baseline		5.0	7.8	69.1	9.8	9.0	.72
EGR-Air-Cat		---	.4	5.2	5.1	4.8	.89
		---	-95%	-92%	-48%	-47%	+24%
		Use	-95	-91	-45	-45	+24

TABLE K-2 (Cont'd). "BEST COMBINATION" WITH EGR RELATIVE TO 1973 BASELINE GASOLINE ENGINES

9-Mode EPA

		Emissions, g /bhp-hr					Composite
		HC		CO	NO_2		BSFC,
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
3-0	1973 Federal*	3.3	4.8	36.0	6.1	5.7	0.67
3-1	EGR-Air-Cat	---	0.2	2.8	4.0	3.5	0.80
		---	-96%	-92%	-34%	-39%	+19%
4-00	1973 Federal	5.7	7.9	63.9	8.8	8.4	0.68
4-1	EGR-Air-Cat	---	0.5	3.6	6.2	5.9	0.72
		---	-94%	-94%	-30%	-30%	+6%
5-0	1973 Federal*	6.6	9.4	119	6.9	6.7	0.72
5-1	EGR-Air-Cat	---	0.3	5.6	4.6	4.4	0.72
		---	-97%	-95%	-33%	-34%	+0%
6-00	1973 Federal	3.7	5.8	75	9.3	8.9	0.68
6-0P	EGR-Air-Cat	---	0.3	3.9	7.3	7.0	0.77
		---	-95%	-95%	-22%	-21%	+13%
7-00	1973 Federal	4.0	6.6	56.9	15.8	15.1	0.62
7-0P	EGR-Air-Cat	---	.3	3.3	4.5	4.6	0.73
		---	-95%	-94%	-72%	-70%	+18%
Avg. of Avgs.		---	-95%	-94%	-38%	-39%	+11%
Composite Averages							
Baseline		4.7	6.9	70	9.4	9.0	.67
EGR-Air-Cat		---	.3	3.8	5.3	5.1	.75
		---	-96%	-95%	-44%	-43%	+12%
		Use	-95	-94	-41	-41	+12

*Ran at 5° B rather than 2.5° B - NO_2 reduced by 10%.

TABLE K-2 (Cont'd). "BEST COMBINATION" WITH EGR RELATIVE TO 1973 BASELINE GASOLINE ENGINES

		23-Mode EPA					
		Emissions, g /bhp-hr					Composite BSFC, lbs/bhp-hr
		HC		CO	NO_2		
Engine	Configuration	NDIR	FID	NDIR	NDIR	CL	
3-0	1973 Federal	---	10.2	94.1	---	4.5	0.71
3-1	EGR-Air-Cat	---	0.6	13.7	---	2.9	0.73
		---	-94%	-85%	---	-36%	+3%
4-00	1973 Federal	---	8.4	92	---	6.1	0.70
4-1	EGR-Air-Cat	---	0.9	15.1	---	4.5	0.75
		---	-89%	-84%	---	-26%	+7%
5-0	1973 Federal*	---	7.6	78	---	8.7	0.67
5-1	EGR-Air-Cat	---	0.3	33	---	4.9	0.72
		---	-96%	-58%	---	-44%	+7%
6-00	1973 Federal	---	4.5	78.4	---	8.0	0.71
6-0P	EGR-Air-Cat	---	0.2	24.3	---	6.9	0.78
		---	-96%	-69%	---	-14%	+10%
7-00	1973 Federal	---	9.9	88.6	---	10.5	0.65
7-0P	EGR-Air-Cat	---	0.4	5.8	---	4.5	0.71
		---	-96%	-93%	---	-57%	+9%
Avg. of Avgs.		---	-94%	-78%	---	-35%	+7%
Composite Averages							
Baseline		---	8.1	86	---	7.6	.69
EGR-Air-Cat		---	.5	18.4	---	4.7	.74
		---	-94%	-79%	---	-38%	+7%
		Use	-94	-78	---	-36	+7

* Run at 5° B rather than 2.5° B - NO_2 reduced by 10%.

TABLE K-3. "BEST COMBINATION" WITH REDUCTION CATALYSTS RELATIVE TO 1973 BASELINE

9-Mode FTP

		Emissions, g /bhp-hr					Composite
		HC		CO	NO$_2$		BSFC,
Engine	**Configuration**	**NDIR**	**FID**	**NDIR**	**NDIR**	**CL**	**lbs/bhp-hr**
6-00	1973 Baseline	4.2	6.7	63.4	10.0	9.5	.77
6-1	R & O Cat	---	0.3	3.1	0.4	0.2	.93
		---	-96%	-95%	-96%	-98%	+21%
7-00	1973 Baseline	4.0	7.1	66.7	14.5	13.5	0.64
7-1	R & O Cat	---	0.5	4.3	0.8	0.5	0.75
		---	-93%	-94%	-94%	-96%	+17%
Composite Averages							
1973 Federal Baseline		4.1	6.9	65	12.3	11.5	.71
Red. & Oxi. Catalysts		---	.4	3.8	.6	.4	.84
		---	-94%	-94%	-95%	-97%	+18%

9-Mode EPA

		Emissions, g /bhp-hr					Composite
		HC		CO	NO$_2$		BSFC,
Engine	**Configuration**	**NDIR**	**FID**	**NDIR**	**NDIR**	**CL**	**lbs/bhp-hr**
6-00	1973 Baseline	3.7	5.8	74.8	9.3	8.9	.68
6-1	R & O Cat	.8	.3	2.7	.5	.3	.81
		---	-95%	-96%	-95%	-97%	+19%
7-00	1973 Baseline	4.0	6.6	56.9	15.8	15.1	0.62
7-1	R & O Cat	0.8	0.6	4.8	0.8	0.5	0.72
		---	-91%	-92%	-95%	-97%	+16%
Composite Averages							
1973 Federal Baseline		3.9	6.2	66	12.6	12.0	.65
Red. & Oxi. Catalysts		---	.5	3.8	.7	.4	.77
		---	-92%	-94%	-94%	-97%	+18%

23-Mode EPA

		Emissions, g /bhp-hr					Composite
		HC		CO	NO$_2$		BSFC,
Engine	**Configuration**	**NDIR**	**FID**	**NDIR**	**NDIR**	**CL**	**lbs/bhp-hr**
6-00	1973 Baseline	---	4.5	78.4	---	8.0	.71
6-1	R & O Cat	---	0.5	34.5	---	0.4	.83
		---	-89%	-56%	---	-95%	+17%
7-00	1973 Baseline	---	9.9	88.6	---	10.5	0.65
7-1	R & O Cat	---	0.7	12.2	---	0.4	0.71
		---	-93%	-86%	---	-96%	+9%
Composite Averages							
1973 Federal Baseline		---	7.2	83.5	---	9.3	.68
Red. & Oxi. Catalysts		---	.6	23.4	---	.4	.77
		---	-92%	-72%	---	-96%	+13%

TABLE K-4. "BEST COMBINATION" WITH REDUCTION CATALYSTS RELATIVE TO 1973 CALIFORNIA BASELINE ENGINE

9-Mode FTP

		Emissions, g /bhp-hr					Composite BSFC,
		HC		CO	NO_2		
Engine	**Configuration**	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
6-0P	Para. Base.*	5.1	6.8	41.2	10.2	9.8	0.92
6-1	R & O Cat	---	0.3	3.1	0.4	0.2	0.93
		---	-96%	-92%	-96%	-98%	+1%
7-0	1973 Calif.	3.4	4.3	26.4	8.2	7.7	0.76
7-1	R & O Cat	---	0.5	4.3	0.8	0.5	0.75
		-76%	-88%	-91%	-90%	-94%	-1%
Composite Averages							
1973 Calif. Baseline*		4.3	5.6	33.6	9.0	8.5	.85
Red. & Oxi. Catalysts		---	.4	3.7	.6	.4	.84
		---	-93%	-89%	-93%	-96%	0%

9-Mode EPA

		Emissions, g /bhp-hr					Composite BSFC,
		HC		CO	NO_2		
Engine	**Configuration**	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
6-0P	Para. Base.*	3.5	4.7	31.9	11.3	10.8	0.74
6-1	R & O Cat	---	0.3	2.7	0.5	0.3	0.81
		---	-94%	-92%	-96%	-97%	+9%
7-0	1973 Calif.	3.4	3.0	24.6	8.1	7.5	0.69
7-1	R & O Cat	0.8	0.6	4.8	0.8	0.5	0.72
		---	-80%	-80%	-90%	-93%	+4%
Composite Averages							
1973 Calif. Baseline*		3.5	3.9	28.3	9.7	9.2	.72
Red. & Oxi. Catalysts		---	.5	3.7	.7	.4	.77
		---	-87%	-87%	-93%	-96%	+7%

23-Mode EPA

		Emissions, g /bhp-hr					Composite BSFC,
		HC		CO	NO_2		
Engine	**Configuration**	NDIR	FID	NDIR	NDIR	CL	lbs/bhp-hr
6-0P	Para. Base.*	---	6.3	68.4	---	9.8	0.74
6-1	R & O Cat	---	0.5	34.5	---	0.4	0.83
		---	-92%	-50%	---	-96%	+11%
7-0	1973 Calif.	---	5.2	22.2	---	6.2	0.67
7-1	R & O Cat	---	0.7	12.2	---	0.4	0.71
		---	-87%	-45%	---	-94%	+6%
Composite Averages							
1973 Calif. Baseline*		---	5.8	42.3	---	8.0	.71
Red. & Oxi. Catalysts		---	.6	23.4	---	.4	.77
			-90%	-47%	---	-95%	+8%

* 1973 California less deceleration on Engine 6.

TABLE K-5. COMPARISON OF 9-MODE FTP AND 23-MODE EPA BASELINE GASOLINE ENGINE RESULTS

1972 Baseline Engine	HC + NO_2 9-Mode	HC + NO_2 23-Mode
2	20	20
3	15	13
4	15	15
5	17	17

1973 Baseline Engine	9-Mode	23-Mode
3	12	15
4	15	15
5	15	16
6	14	13
7	19	20

	Emissions, g /bhp-hr					
	HC		CO	NO_2		
9-Mode FTP	NDIR	FID	NDIR	NDIR	CL	HC + NO_2
1972 Baseline (4 ea)	5.1	---	52	11.5	---	16.6
1973 Baseline (5 ea)	5.0	---	67	10.0	---	15.0
Overall Average	5.0	---	60	10.7	---	15.7
23-Mode EPA						
1972 Baseline	---	8.0	81	----	8.3	16.3
1973 Baseline	---	8.1	86	----	7.6	15.7
Overall Average	---	8.1	84	----	7.9	16.0

APPENDIX L

Note: No data is enclosed in APPENDIX L

APPENDIX M

VARIOUS CATEGORY GENERAL INFORMATION

TABLE M-1. EXPLANATION OF NINE-MODE FTP AND NINE-MODE EPA BRAKE SPECIFIC COMPUTER PRINTOUT SHEETS

COLUMN EXPLANATION

Column	Column Title	Explanation
1	MODE	For FTP--Mode number and manifold vacuum For EPA--Mode number and % of max. torque
2	AS MEASURED HC	Measured hydrocarbon emissions, ppm of n-hexane
	AS MEASURED HC-FID	Measured hydrocarbon emissions, ppm C
3	AS MEASURED CO	Measured carbon monoxide emissions in percent
4	AS MEASURED CO_2	Measured carbon dioxide emissions in percent
5	AS MEASURED NO	Measured nitrogen oxide emissions in ppm NO
	AS MEASURED NO-CL	Measured oxides of nitrogens emissions in ppm NO_2
6	TOTAL CARBON	The percentage of exhaust gas that is carbon containing gases
7	FUEL CONS.	Engine fuel consumption in Grams/Hr.
8	CALCULATED (GM/HR) HC	Hydrocarbon emissions in Grams/Hr. calculated from measured HC (HC by FID corrected to dry basis by factor K_1 where $K_1 = 1 + .00925\ (CO\ \% + CO_2\%)$)
9	CALCULATED (GM/HR) CO	Carbon monoxide emissions in Grams/Hr. calculated from measured CO
10	CALCULATED (GM/HR) NO_2	Nitrogen dioxide emissions in Grams/Hr. calculated from measured NO or NO_2
11	WT. FACT.	Weighting factor for each mode
12	WEIGHTED (GM/HR)HC	Hydrocarbon emissions in Grams/Hr. times the weighting factor
13	WEIGHTED (GM/HR)CO	Carbon monoxide emissions in Grams/Hr. times the weighting factor
14	WEIGHTED (GM/HR)NO_2	Oxides of nitrogen emissions as NO_2 Grams/Hr. times the weighting factor
15	HP	Engine horsepower from dynamometer
16	MAN. VAC.	Measured manifold vacuum in inches of mercury

TABLE M-1 (CONT'D) EXPLANATION OF NINE-MODE FTP AND NINE-MODE EPA BRAKE SPECIFIC COMPUTER PRINTOUT SHEETS

LINE EXPLANATION	EXPLANATION
1st line	Table number and Title
2nd line	
ENGINE (X)-(X)	SwRI engine identification number
TEST - (X)	Test number. Tests numbered sequentially.
RUN (X)	Run number of a specific test.
BETWEEN RUN & DATE	Brief description of engine configuration.
(XX) - (XX)-72	Date in month, day and year.
K = (X.XX)	Humidity correction factor for cycle composite NO_2. $K = .634 + .00654 H - .0000222H^2$. Where H = absolute humidity in grams/lb DA
HUM = (XXX) GR/LB	Absolute humidity in grams/lb DA during run.
Line Starting CYCLE COMPOSITE	Grams/BHP-HR for cycle, summation of the weighted emission for each mode divided by the summation of the weighted horsepower for each mode, i.e. $\frac{(\text{Emission x W.F.})}{(\text{H.P. x W.F.})}$
AVERAGE SUM - (COMPOSITE VALUES FOR CYCLES 1 AND 2)	$\frac{\text{SUM (cycle 1)} + \text{SUM (cycle 2)}}{2}$
AVERAGE SUM - (COMPOSITE VALUES FOR CYCLES 3 AND 4)	$\frac{\text{SUM (cycle 3)} + \text{SUM (cycle 4)}}{2}$
FOUR CYCLE COMPOSITE	Composite of all four cycles in Grams/BHP-HR using formula shown
CORRECTED NO_2	Four cycle composite NO_2 in grams/BHP-HR times the humidity correction factor, K.

TABLE M-2.EXPLANATION OF EXPERIMENTAL 23 MODE BRAKE SPECIFIC COMPUTER PRINTOUT SHEETS

Upper table Column	Column Title	Explanation
1	MODE	Mode number (1-23)
2	SPEED	Engine speed in rpm
	DYNA. LOAD	Measured dynamometer load in ft-lbs.
4	HP	Horsepower calculated from dynamometer load and speed using equation: $HP = \frac{(ft\text{-}lbs) \times rpm}{5252}$
5	MAN. VAC.	Measured manifold vacuum in inches of Mercury
6	FUEL RATE LB/HR	Measured lb/hr of fuel used
7	A/F RATIO	Air-fuel ratio (see equation at end of explanations).
8	DRY CONCENTRATION ALDE	Measured aldehyde emission concentration as formaldehyde (ppm) corrected to a dry (water from combustion removed) basis by the equation: $ALDE = ALDE \text{ (as measured wet)} \times K_1$ where $K_1 = \frac{(100 - .925 (CO\% - CO_2\%)}{100}$
9	DRY CONCENTRATION HC	Measured hydrocarbon emission concentration (ppmC) corrected to a dry basis as above.
10	DRY CONCENTRATION CO	Measured carbon monoxide emission concentration, % by volume. Measured dry with water of combustion removed.
11	DRY CONCENTRATION CO_2	Measured carbon dioxide emission concentration, % by volume. Measured dry.
12	DRY CONCENTRATION NO	Measured oxides of nitrogen emission concentration as NO_2(ppm). Measured dry.

TABLE M-2(Cont'd) EXPLANATION OF EXPERIMENTAL 23 MODE BRAKE SPECIFIC COMPUTER PRINTOUT SHEETS

Lower table Column	Column Title	Explanation
1	MODE	Mode number (1-23)
2	CALCULATED GRAM/ HR ALDE	Calculated aldehyde emission concentration as formaldehyde in grams/hr $ALDE(gm/hr)=2.16\times\frac{ALDE}{10000}\times\frac{\text{fuel flow(grams/hr)}}{\text{total carbon}}$ where Total Carbon= $CO_2\%+CO\%+\frac{HC(ppm)}{10000}$
3	CALCULATED GRAM/HR HC	Calculated hydrocarbon emission concentration in grams/hr $HC(gm/hr)=$ $\frac{HC}{10000}\times\frac{\text{fuel flow(grams/hr)}}{\text{total carbon}}$
4	CALCULATED GRAM/ HR CO	Calculated carbon monoxide emission concentration in grams/hr $CO=2.02\times CO\times\frac{\text{fuel flow(grams/hr)}}{\text{total carbon}}$
5	CALCULATED GRAM/HR NO_2	Calculated oxides of nitrogen emission concentration as NO_2 in grams/hr $NO_2=3.32\times\frac{NO}{1000}\times\frac{\text{fuel flow(grams/hr)}}{\text{total carbon}}$
6	WT. FAC.	Weighing factor for each mode
7	WT. HP	Weighted horsepower. HP (Column 4) times weighting factor (Column 16)
8	BRAKE SPECIFIC ALDE	Aldehyde, gm/hr, (Column 2) divided by HP (Column 4, upper table) for the individual mode. "R" in table indicates indeterminate value.
9	BRAKE SPECIFIC HC	HC, gm/hr, (Column 3) divided by HP (Column 4, upper table) for the individual mode
10	BRAKE SPECIFIC CO	CO, gm/hr, (Column 4) divided by HP (Column 4, upper table) for the individual mode.
11	BRAKE SPECIFIC NO_2	NO_2, gm/hr, (Column 5) divided by HP (Column 4, upper table) for the individual mode.

TABLE M-2 (Cont'd) EXPLANATION OF EXPERIMENTAL 23 MODE BRAKE SPECIFIC COMPUTER PRINTOUT SHEETS

CYCLE COMPOSITE	Explanation
HC, CO, NO_2, ALDE	Summation of the weighted emission for each mode divided by summation of the weighted horsepower for each mode. $\dfrac{\sum_{i=1}^{23} (\text{Emission}_{(i)} \times \text{W. F.}_{(i)})}{\sum_{i=1}^{23} (\text{HP}_{(i)} \times \text{W. F.}_{(i)})}$
BSFC	Summation of fuel flow (lbs/hr) times weighting factor for each mode divided by summation of weighed horsepower for each mode. $\dfrac{\sum_{i=1}^{23} (\text{Fuel flow (lb/hr)}_{(i)} \times \text{W F}_{(1)})}{\sum_{i=1}^{23} (\text{HP}_{(i)} \times \text{W F}_{(i)})}$

Spindt formula for calculation of the air-fuel ratio.

$$FB(I) = \frac{(CO(I) + CO_2(I))}{TC(I)}$$

$$AFR = FB \left\{ 9.8831 \left[\frac{\left(1 + \frac{CO(I)}{2(CO_2(I)} + \frac{O_2(I)}{CO_2(I)} \right)}{1 + \frac{CO(I)}{CO_2(I)}} \right] + \left[\frac{16.8}{3.5 + \frac{CO(I)}{CO_2(I)}} \right] \right\}$$

M-3. ENGINE INFORMATION

Engine Code No. ____________

Project 11-3634-001 Recorded by ______________ Date __________

Make ____________________ Engine Serial ____________________

No. Cylinders ____________ Arrangement ____________________

Displacement ____________ Model Year ____________________

Carburetor Barrels ________ Operating Hours on Engine __________

Carburetor Information ______________________________________

Measured Timing ________ °BTDC at ______ Idle rpm __________

Intake Vacuum at Idle, in. Hg ______ Rated Hp _____ at _______ RPM

Distributor Information ______________________________________

Comments Concerning Engine ______________________________________

Rated Torque _____ at _____ RPM Observed Torque _____ at _____ RPM

Special Equipment Installed:

(1) ______________________________________
(2) ______________________________________
(3) ______________________________________
(4) ______________________________________
(5) ______________________________________

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TABLE M-4. COMPOSITION OF EM-191-F GASOLINE USED IN PROJECT 11-3634-001

(Special Unleaded Grade of VV-G-001690)

Gravity, °API	57.5
RVP, lbs.	8.8
Distillation, °F	
IBP	94
10%	133
50%	220
90%	328
EP	382
Gum, mg/100 ml - unwashed	2
Aromatics, %	30
Olefins, %	3
Sulfur, wt %	<.01
Oxidation Stability	>600
Lead, gm/gal	.04*
Phosphorus, gm/gal	.007**
Research Octane No.	92.5
Motor Octane No.	84.0

*Determined using Atomic Adsorption Method
**Determined using Dupont Method

APPENDIX M-5. SAMPLE NON-DISCLOSURE AGREEMENT

March 20, 1973

Southwest Research Institute
8500 Culebra Road
San Antonio, Texas 78284

Attention: ____________

Gentlemen:

It is our understanding that Southwest Research Institute (hereinafter "SwRI") plans to carry out a program to study exhaust emissions from gasoline fueled trucks equipped with catalytic emission control systems. You have expressed an interest in including certain catalysts which have been developed by ________ for treatment of automotive exhaust gases in such program. Since the sample catalysts which we would supply to you for this purpose may not have been released for unrestricted sale at the time of submission to SwRI, and may embody certain of our proprietary and confidential information, we are agreeable to supplying you with samples on the following express understanding:

1. ________ will make available at no cost to SwRI such sample catalysts as ________ deems may be useful in the test program to be carried out by SwRI, together with such of ________ technical information concerning the recommended test conditions for testing and/or operating such catalysts as would in ________ sole judgment be useful to SwRI. ________ shall have no obligation to disclose to SwRI any information ________ deems confidential, including but not limited to the composition and/or method of manufacture of any such catalyst sample.

2. SwRI agrees it will not make catalysts furnished to it by ________ hereunder available to any third party, and that it will not itself, nor permit others to undertake any chemical analysis of the catalyst; provided, however, that SwRI shall have no liability to ________ in the event any governmental agency shall compel SwRI to furnish ________ catalyst samples to it. SwRI agrees to provide ________ with prompt notice of any

attempt to so compel SwRI, and SwRI shall keep __________ fully informed of the circumstances. All catalysts furnished to SwRI hereunder shall remain the property of __________ and all catalysts except losses incident to testing shall, at __________ request, be returned to __________ upon conclusion of testing or any discontinuance of participation pursuant to Paragraph 7, whichever first occurs.

3. Subject to the provisions of Contract No. 68-01-0472 effective March 8, 1973 between United States (Environmental Protection Agency) and SwRI, and subject to prior approval of Environmental Protection Agency, SwRI shall make available to __________ all test data in respect of performance characteristics of catalysts furnished to it hereunder as is developed and/or acquired by SwRI. Such test data shall be supplied to __________ on a non-confidential basis.

4. Except as provided in Paragraph 2, neither party shall have any obligation to treat as confidential any information received by it hereunder. SwRI agrees, however, that it will not identify any catalyst as of __________ origin in connection with transmission of test data to third parties other than Environmental Protection Agency without the prior written consent of __________.

5. Nothing in this agreement shall be understood as granting, expressly or by implication, any rights to either party under the patents, technical information or know-how of the other party, except as, and to the extent, expressly set forth herein; nor as giving rise to any obligation on the part of __________ to supply, or SwRI to purchase, any catalysts tested hereunder.

6. Nothing in this agreement shall prevent either party at any time from conducting an evaluation of automotive emission control catalysts for any third party.

7. Either party may at any time upon written notice to the other discontinue its further participation in the program hereunder; otherwise, participation by the parties in said program shall end one (1) year from the date hereof, unless the period of participation shall be extended by mutual agreement in writing. Termination of this agreement shall not relieve any obligations hereunder with respect to catalyst samples; and upon termination of this agreement, subject to the provisions of Contract No. 68-01-0472 effective March 8, 1973 between the United States (Environment Protection Agency) and SwRI, and subject to prior approval of Environmental Protection Agency, SwRI shall promptly make available to __________ all test data specified by Paragraph 3 not previously made available to ______________.

8. No advertising or publicity containing any reference to SwRI or any of its employees, either directly or by implication, shall be made use of by __________ or on ___________ behalf without SwRI's written approval.

If you are in agreement with the above, would you please so indicate by having an authorized representative of SwRI sign both copies of this letter agreement and return one copy to us.

Very truly yours,

UNDERSTOOD AND AGREED TO:

SOUTHWEST RESEARCH INSTITUTE

BY______________________________

TITLE___________________________

DATE____________________________

APPENDIX M-6. HEAVY TRUCK DRIVEABILITY RATING PROCEDURE

Applicability: Truck and truck tractors above 16,000 lbs GVW powered by gasoline engines and diesels intended for comparable type operation (i.e. mid-range diesel engines).

Objective: Determine for a given truck equipped with a given emission control system whether its operation, safe handling and general performance are impaired relative to the same truck without emission control driveability.

Approach: Operate a given truck without and with emission control system operative to determine on a "back-to-back" basis whether emission control deteriorated vehicle driveability as herein defined. The reference truck will be the truck in "standard" or non-emission control configuration and evaluation and comparison made against this reference for a given vehicle.

Definitions: The following are definitions of terms to be used.

1. Road Load - A fixed throttle position which maintains a constant vehicle speed on a level road.
2. Coast - Deceleration at closed (curb idle) throttle.
3. Wide Open Throttle (WOT) Acceleration - An acceleration made entirely at wide open throttle (from any speed).
4. Part Throttle (PT) Acceleration - An acceleration made at any fixed throttle position less than WOT.
5. Tip-In - Vehicle response (up to two seconds in duration), to the initial opening of the throttle.
6. Crowd - An acceleration made at a continually increasing throttle opening.
7. Idle Quality - An evaluation of vehicle smoothness, with the engine at curb idle in drive, as judged from the driver's seat.
8. Backfire - An explosion in the induction or exhaust system.

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9. Hesitation - A temporary lack of initial response in acceleration rate.

10. Stumble - A short, sharp reduction in acceleration rate.

11. Lean Operation - This condition, depending on its severity, can manifest itself as outlined in the following categories:

    A. Stretchiness - A lack of anticipated response to throttle movement. This may occur on slight throttle movement from road load or during light to moderate accelerations.

    B. Surging - A condition of leanness, resulting in short, sharp fluctuations. These may be cyclic or random and can occur at any speed and/or load.

12. After-run - A condition where the engine continues to run after the ignition has been shut off.

13. Detonation (spark knock) - A knock or ping which is recurrent or repeatable in terms of audibility.

Rating Scale: The following four step rating scale will be employed where judgment is required.

Satisfactory (S) - a rating indicating no malfunction.

Trace (T) - Rating of a malfunction that is just discernible to a test driver.

Moderate (M) - Rating of a malfunction that is judged to be probably noticeable to the average driver.

Heavy (H) - Rating of a malfunction that is pronounced and judged to be obvious to any driver.

Procedure: This procedure consists of four major parts.

I. Preparations: The vehicle is to be prepared by adding sufficient weight to bring the vehicle to one-half payload using drums of water. One-half payload is empty or curb weight plus one-half the nameplate GVW - curb weight. Install intake manifold pressure gage, engine rpm tach and fifth wheel with mph and distance traveled accessories.

Drain tank and use same fuel used in stationary tests. Locate truck for overnight soak 8 hr. minimum and straight out driveaway. A smooth-surface road, free of traffic interference including turns, moderate uphill, downhill but mostly level closed course will be used. The same crew must be used on all tests with a given truck.

II. Cold Start and Driveaway

This part is intended to evaluate the "cold" start and subsequent driveability of the truck before fully warmed-up. Cold soak means allowing the vehicle to sit overnight (minimum of 8 hours) at ambient temperatures of 50-75°F. Outdoor or Indoor soak is allowed as long as all tests on a given vehicle are consistent.

Three areas of operation are to be rated, idle, acceleration and deceleration as shown by the attached data sheet. Major emphasis is given the idle quality as S, T, M, or H and number of stalls and the acceleration quality and stalls.

Using Figure 1 to depict the road course and the attached cold start driveaway data sheet, the stepwise procedure will be to:

Step 1. (Idle) Start engine using Manufacturers Recommended Procedure. Onmanual choke, use as recommended and required normally. Record engine rpm in neutral immediately after start, with foot off throttle pedal. Idle 20 seconds (Note position of manual choke). During the 20 second period, evaluate idle quality and record number of stalls.

Step 2. (Idle) At end of 20 seconds, clear engine by accelerating briefly to moderately high idle speed and remove foot from throttle and record engine rpm (neutral). Evaluate quality of idle as satisfactory or rough (T, M or H) and number of stalls during 10 second idle.

Step 3. (Idle) Depress clutch and place transmission in proper low gear for driveaway. (Not normally 1st or low low). During 5 second idle, record engine rpm, evaluate idle quality and stalls.

Note: In event engine stalls during idle phase, restart engine and begin idle sequence with Step 1, Step 2, if stall occurred in Step 2 or Step 3 if stall occurred in Step 3. Also, on manual choke, use no more choke than necessary and eliminate choke use as soon as practical. Note when choke movement is made and amount of movement.

Step 4. (PT accel) A to B	Make a moderate acceleration to 25 mph on level road using normal driving habit to upshift through the gears necessary to achieve a high gear from which a WOT accel to 35 mph can be achieved without additional shifting. During the PT accel, record accel quality as satisfactory or in terms of T, M or H, if a malfunction is noted. If engine stalls, restart and begin at Step 3 and note same. If engine stalls again, move choke as required, note movement, and restart at step 3.
Step 5. (Hold) B to C	Maintain 25 mph to point C. No rating necessary during this brief downhill portion of course.
Step 6. (WOT accel) C to D	Accelerate WOT from 25 to 35 mph in previously selected gear up slight hill to point D on course. Evaluate quality and if engine stalls, return to Step 3.
Step 7. (CT decel) D to E	Decel, foot off throttle, from 35 to 0 mph and note quality, backfires, etc. This is a slight uphill decel.
Step 8. (PT accel) E to F	Accelerate at part throttle on level road from points E to F from 0 to 25 mph and note quality.
Step 9. (Hold) F to G	Maintain 25 mph to point F. No rating necessary
Step 10. (CT decel) G to H	Decelerate at closed throttle from 25 to 0 mph and note quality. This is a constant speed decel for most part to stop sign at H.
Step 11. (WOT accel) H to J	Accelerate at wide open throttle from 0 to 35 mph and note quality on mostly level course from points H to J.
Step 12. (CT decel) I to J	Decelerate at cut throttle from 35 to 0 mph and note quality. This is mostly constant speed decel on downhill portion of course from I to J.
Step 13. (PT accel) J to K	Accelerate at heavy part throttle from 0 to 25 mph and note quality over course from J through K, level road.

Step 14. (WOT accel) K to L	WOT accel from 25 to 35 mph as in Step 6 but on level road (points K to L). Note quality.
Step 15. (Decel) L to M	Decelerate, foot off throttle, from 35 to 25 mph into left and right turns. Note quality and backfires.
Step 16. (WOT accel) M to N	Come out of double turns (level road) from point N to O with WOT accel from 25 to 35 mph and note quality.
Step 17. (CT decel) N to O	Decel at closed throttle to rest from 35 mph, so that vehicle is positioned for accel from stop. Note quality during decel.
Step 18. (PT accel) O to P	This is a fairly heavy part throttle accel from 0 to 25 mph up moderate part of uphill portion of course from point O to P, note quality
Step 19. (WOT accel) P to Q	WOT accel from 25 to 35 on moderately uphill leg of course from points P to Q.
Step 20. (PT decel) Q to R	This is rapid deceleration due to uphill nature of course from Q to R. Use some light throttle to complete 35 to 0 deceleration at R.
Step 21. (WOT accel) R to S	WOT accel through gears to reach 25 mph from rest on uphill portion R to S.
Step 22. (PT Decel) S to A	This final decel returns vehicle to rest at point A (starting point) and may be made a light part throttle.
Step 23. (Idle 30 sec.)	Idle for 30 seconds, clutch pedal depressed, transmission in gear. Evaluate idle quality and record engine rpm.

Repeat Steps 4 through 23 above to complete data sheet. The 25 to 35 mph speed range can be changed to 20 to 30 or 30 to 40 based on gear selection available at the discretion of the test engineer. All tests on given vehicle to be consistant. Evaluate driveability on all steps except steps 5 and 9.

Repeat Steps D through M above three times to complete data sheet. Depending on data and repeatability of driveability evaluations, Steps D through M may be repeated at the discretion of the test engineer. The 25 to 35 mph speed range can be changed to 20 to 30 or 30 to 40 based on gear selection available at the discretion of the test engineer. All tests on given vehicle to be consistant.

III. Warm Vehicle Driveability

This part is intended to evaluate the driveability and performance of a fully warmed-up truck and utilizes a separate data sheet (attached). The maximum speed involved should be 60 mph if this can be achieved readily with the load etc. on level road. If not, decrease to 55 or 50 and stay consistent with all tests on given truck. All accels and decels to follow normal driving habit and good driving practice on upshifting and which speed axle etc. to use. Also, the repetitive 25 - 40 and 25 - 35 accels can be shifted to other speeds depending on the capabilities of given truck at the discretion of the test engineer. All runs on given truck to be consistant.

The following stepwise procedure relates to the data sheet. The procedure begins with vehicle thoroughly warmed up with equivalent of about 10 miles of freeway driving.

Step 1.
Idle

After completion of warm-up, allow vehicle to come to rest and begin 30 second idle. Evaluate idle quality.

Step 2.
Cruise

This is a series of road load runs each made both directions over a level course and the results averaged and recorded. Use the gear which gives best overall truck operation at lower engine speed where there is option. Note quality of operation and record.

Step 3.
WOT accel
25 - 40

Accelerate WOT with rapid fast action and throttle opening from 25 to 40 mph in same gear used in cold start driveaway procedure. Evaluate quality.

Step 4.
CT decel

Decel, foot off throttle, from 40 to 25 mph and note quality, backfires etc.

Step 5.
WOT accel
25 - 40

Repeat Step 3, but with a slow deliberate foot action to achieve WOT.

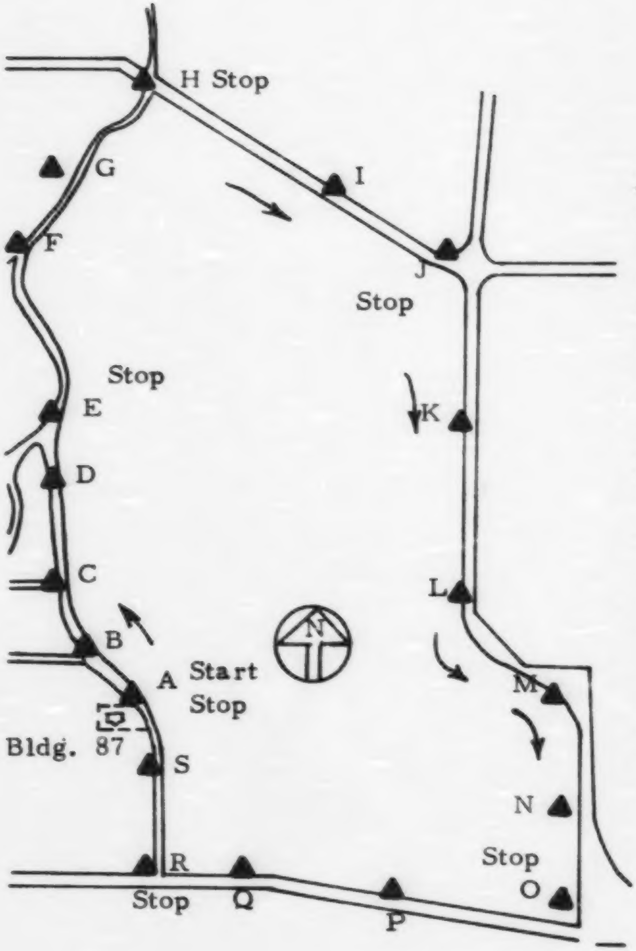
Step 6. PT decel 40 - 25	Decelerate at very light part throttle (approximately 19 in Hg) from 40 to 25 mph and note quality.
Step 7. PT accel 25 - 35	Accelerate at light constant part throttle (approximately 14 in Hg) and note quality.
Step 8. CT decel 35 - 25	Decelerate, throttle closed, from 35 to 25 mph and note quality, backfires, etc.
Step 9. PT accel 25 - 35	Same as Step 7 PT accel, but with moderate constant part throttle (approximately 10 in Hg) and note quality.
Step 10. PT decel 35 - 25	Same as Step 8, but at very light throttle opening of about 19 in Hg.
Step 11. PT accel 25 - 35	Same as Step 7, but with heavy constant throttle opening at about 6 in Hg. Note and record quality.
Step 12.	Same as Step 8.
Step 13. PT accel 25 - 40	This is part throttle crowd accel with light throttle action in that throttle is opened more and more with time, but at a slow or "light" rate. Evaluate quality.
Step 14.	Same as Step 6.
Step 15.	Same as Step 13, but with a moderate rate of crowd, i. e. between a slow and fast crowd.
Step 16.	Same as Step 4.
Step 17.	Same as Step 13, but with a rapid or fast rate of crowd.
Step 18.	Same as Step 14.
Step 19. PT Tip-in @ 25	Moderate part throttle accel from 25 mph cruise. Measure time required to recognize a change in vehicle speed following initial opening of throttle plate. Repeat test after return to 25 mph cruise for 30 seconds.
Step 20.	Same as Step 19, but from 35 mph cruise.

Step 21. WOT accels 0 - 60	These are pre-conditioning runs for Steps 22 and 23 and are run in rapid succession.
Step 22.	Immediately on completion of a CT decel from the last 0 - 60 accel in Step 21, allow engine to idle for 30 seconds and evaluate quality.
Step 23. Soak	Cut-off ignition switch and note any after run.
Step 24. Idle	Restart engine and allow to idle for 30 seconds, evaluate quality.
Step 25. Engine off	Cut-off ignition switch and note any after run.

IV. Accel-Decel Performance

This part is to establish acceleration and deceleration performance of the truck over level road course. Operation both ways over the course is required and results averaged. Attached is sample data sheet that is fairly explanatory. Step 1 is a sequence of 0 - 20 WOT accels. Steps 2 and 3 are similar WOT accels from rest. Step (4) is a WOT accel from 20 to 50 mph followed by CT decel. A ten second idle precedes each accel and a 5 second stabilization at each max speed is effected before each decel.

Step 5 will consist of measuring the max speed achieved and time required to accelerate from rest over a course starting with level road and ending with a fairly steep uphill grade. This type of driving represents the real world and is included to give some measure of performance on a grade. The same course will be used for a given truck though the course may be different for tractors than for trucks.



Point	Description	Miles	Cumu-lative
A-B	Level curved	0.104	0.104
B-C	Sharp dwnhill curved	0.060	0.164
C-D	Steady, mod. uphill straight	0.178	0.342
D-E	Steady, mod. uphill straight	0.120	0.462
E-F	Level, curved road	0.227	0.689
F-G	Level, curved road	0.175	0.854
G-H	Mod. dwnhill, curved road	0.150	1.014
H-I	Mostly level, straight	0.315	1.329
I-J	Mod. steady, dwnhill, straight	0.181	1.510
J-K	Level, straight	0.229	1.739
K-L	Level, straight	0.240	1.979
L-M	Level, double sharp bends	0.245	2.224
M-N	Level, sharp bend and straight	0.180	2.404
N-O	Level, straight	0.161	2.565
O-P	Slight to mod. uphill, straight	0.269	2.834
P-Q	Mod. uphill, straight	0.214	3.048
Q-R	Mod. to light uphill, straight	0.140	3.188
R-S	Mod. uphill, straight	0.100	3.288
S-A	Light uphill to level, curved	0.146	3.434

APPENDIX M-6. FIGURE 1. COLD START DRIVEABILITY ROAD ROUTE

APPENDIX M-6. COLD START AND DRIVEAWAY EVALUATION

p. 1 of 2

Vehicle No. ____________ Engine No. ______________ License No. __________
Date: __________ Time: Start ________ Finish ________ Odo.: Start ______ Finish ____
GVW: __________ lbs Empty __________ lbs Test Weight __________ lbs

Vehicle	Weather	Crew
Make ______________	Temp.: Wet/Dry °F _____/_____	Driver: ______________
Model ______________	Bar. Press in Hg. __________	Recorder: ______________
Year ______________	Road Conditions: __________	Observer(s): __________
Trans. __________ Gears	Wet ______ Dry ______	______________
Rear __________ Speeds	Wind: Speed ________ mph	______________
Tire Size: ______________	Soak Time (hrs) ________	______________
Remarks:		

Start Time (Sec) Attempts

			Idle			Acceleration								Decel			
			Qual			Quality								Qual			
Step	Condition	Rpm	Satis	Rough*	No. of Stalls	Satis	Hesit*	Stumble*	Stretch*	Surge*	Detonation*	No. of Stalls	No. of Backfires	Satis	Surge*	No. of Backfires	No. of Stalls
1	Fast Idle Cam 28 sec					X	X	X	X	X	X	X	X	X	X	X	X
	Clear	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Neutral 20 sec					X	X	X	X	X	X	X	X	X	X	X	X
3	Low Gear(1) 5 sec					X	X	X	X	X	X	X	X	X	X	X	X
4	PT accel A to B (0-25)	X	X	X	X									X	X	X	X
5	Hold 25 B to C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	WOT accel C to D (25-35)	X	X	X	X									X	X	X	X
7	CT Decel D to E (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
8	PT accel E to F (0-25)	X	X	X	X									X	X	X	X
9	Hold 25 F to G	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	CT decel G to H (25-0)	X	X	X	X	X	X	X	X	X	X	X	X				
11	WOT accel H to I (0-35)	X	X	X	X									X	X	X	X
12	CT decel I to J (35 - 0)	X	X	X	X	X	X	X	X	X	X	X	X				
13	PT accel J to K (0-25)	X	X	X	X									X	X	X	X
14	WOT accel K to L (25-35)	X	X	X	X									X	X	X	X
15	CT decel L to M (35-25)	X	X	X	X	X	X	X	X	X	X	X	X				
16	WOT accel M to N (25-35)	X	X	X	X									X	X	X	X
17	CT decel N to O (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
18	PT accel O to P (0-25)	X	X	X	X									X	X	X	X
19	WOT accel P to Q (25-35)	X	X	X	X									X	X	X	X
20	PT decel Q to R (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
21	WOT accel R to S (0-25)	X	X	X	X									X	X	X	X
22	PT decel S to A (25-0)	X	X	X	X	X	X	X	X	X	X	X	X				
23	Idle (30 sec)					X	X	X	X	X	X	X	X	X	X	X	X

*T-Trace, M-Moderate, H-Heavy

In Steps 11, 12, 14, 15, 16, 17, 19 and 20 may be changed from 35 to 40 mph. In Steps 21 and 22, 25 can be changed to 30 mph.

APPENDIX M-6. COLD START AND DRIVEAWAY EVALUATION

p. 2 of 2

Vehicle No. ______________ Engine No. ________________ License No. __________

Date: _____________

Step	Condition	Rpm	Idle			Acceleration								Decel			
			Qual		No. of Stalls	Quality						No. of Stalls	No. of Backfires	Qual		No. of Backfires	No. of Stalls
			Satis	Rough*		Satis	Hesit*	Stumble*	Stretch*	Surge*	Detonation*			Satis	Surge*		
4	PT accel A to B (0-25)	X	X	X	X									X	X	X	X
5	Hold 25 B to C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	WOT accel C to D (25-35)	X	X	X	X									X	X	X	X
7	CT Decel D to E (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
8	PT accel E to F (0-25)	X	X	X	X									X	X	X	X
9	Hold 25 F to G	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	CT decel G to H (25-0)	X	X	X	X	X	X	X	X	X	X	X	X				
11	WOT accel H to I (0-35)	X	X	X	X									X	X	X	X
12	CT decel I to J (35 - 0)	X	X	X	X	X	X	X	X	X	X	X	X				
13	PT accel J to K (0-25)	X	X	X	X									X	X	X	X
14	WOT accel K to L (25-35)	X	X	X	X									X	X	X	X
15	CT decel L to M (35-25)	X	X	X	X	X	X	X	X	X	X	X	X				
16	WOT accel M to N (25-35)	X	X	X	X									X	X	X	X
17	CT decel N to O (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
18	PT accel O to P (0-25)	X	X	X	X									X	X	X	X
19	WOT accel P to Q (25-35)	X	X	X	X									X	X	X	X
20	PT decel Q to R (35-0)	X	X	X	X	X	X	X	X	X	X	X	X				
21	WOT accel R to S (0-25)	X	X	X	X									X	X	X	X
22	PT decel S to A (25-0)	X	X	X	X	X	X	X	X	X	X	X	X				
23	Idle (30 sec)					X	X	X	X	X	X	X	X	X	X	X	X

*T-Trace, M-Moderate, H-Heavy

In Steps 11, 12, 14, 15, 16, 17, 19 and 20 may be changed from 35 to 40 mph. In Steps 21 and 22, 25 can be changed to 30 mph.

APPENDIX M-6. WARM VEHICLE DRIVEABILITY EVALUATION

Vehicle No. ____________ Engine No. ____________ License No. ____________
Date: ____________ Time: Start ________ Finish ______ Odo.: Start _____ Finish ____
GVW: _________ lbs Empty _________ lbs Test Weight ________ lbs

Vehicle	Weather	Crew
Make ____________	Temp.: Wet/Dry° F ____/____	Driver: ____________
Model ____________	Bar. Press in. Hg. ________	Recorder: ____________
Year ____________	Road Conditions: ________	Observer(s): ________
Trans. ______ Gears	Wet _____ Dry _____	____________
Rear ______ Speeds	Wind: Speed _____ mph	____________
Tire Size: ________		____________
Remarks:		

Step	Conditions	Mph	Gear	Rpm	Vac.	Idle Qual Satis	Idle Qual Rough*	Idle No. Stalls	Drive Conditions Quality Satis	Hesit*	Stumble*	Stretch*	Surge*	Detonation*	No.Bkfires	Time, sec
1	Idle 30 sec	0	Low						X	X	X	X	X	X	X	
2	Cruise	20				X	X	X		X	X	X			X	X
	(Run both	30				X	X	X		X	X	X			X	X
	directions	40				X	X	X		X	X	X			X	X
	and average	50				X	X	X		X	X	X			X	X
		60				X	X	X		X	X	X			X	X
3	WOT Accel	25-40		X Rapid	open XX	X	X	X							X	X
4	CT Decel	40-25		XXXX	XXXXX	X	X	X		X	X	X		X		X
5	WOT Accel	25-40		XSlow	open XX	X	X	X								X
6	PT 19 in Decel	40-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
7	PT 14 in Accel	25-35		XXXX	XXXXXX	X	X	X								X
8	CT Decel	35-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
9	PT 10 in Accel	25-35		XXXX	XXXXXX	X	X	X								X
10	PT 19 in Decel	35-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
11	PT 6 in Accel	25-35		XXXX	XXXXXX	X	X	X								X
12	CT Decel	35-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
13	PT Light Crowd	25-40		XXXX	XXXXXX	X	X	X								X
14	PT 19 in Decel	40-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
15	PT Mod Crowd	25-40		XXXX	XXXXXX	X	X	X								X
16	CT Decel	40-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
17	PT Heavy Crowd	25-40		XXXX	XXXXXX	X	X	X								X
18	PT 19 in Decel	40-25		XXXX	XXXXXX	X	X	X		X	X	X		X		X
19	PT Tip - In 1 @	25		XXXX	XXXXXX	X	X	X								
	2 @	25		XXXX	XXXXXX	X	X	X								
20	PT Tip - In 1 @	35		XXXX	XXXXXX	X	X	X								
	2 @	35		XXXX	XXXXXX	X	X	X								
21	WOT Accels	0-60	XXXX	Repeat	3 times in succession											
22	Idle 30 sec	0	low						X	X	X	X	X	X	X	X
23	Soak 15 min	After Run	Yes	No					X	X	X	X	X	X	X	X
24	Idle 30 sec								X	X	X	X	X	X	X	X
25	Engine off	After Run	Yes	No					X	X	X	X	X	X	X	X

*T-Trace; M-Moderate; H-Heavy

APPENDIX M-6. ACCEL-DECEL PERFORMANCE

Vehicle No. ____________ Engine No. ______________ License No. __________
Date: __________ Time: Start ________ Finish ______ Odo.: Start _____ Finish ______
GVW: __________ lbs Empty __________ lbs Test Weight _________ lbs

Vehicle	Weather	Crew
Make ______________	Temp.: Wet/Dry °F ____/____	Driver: ______________
Model ______________	Bar. Press in. Hg. __________	Recorder: ______________
Year ______________	Road Conditions: __________	Observer(s): __________
Trans. _____ Gears	Wet ______ Dry _____	______________
Rear ________ Speeds	Wind: Speed _______ mph	______________
Tire Size: __________	Soak Time (hrs) ________	______________
Remarks:		

Step	Condition	Run	Mph	Gear		Time	Counts	Quality Note
				Start	End			
(1)	WOT Accel	1	0-20					
	WOT Accel	2	0-20					
(2)	WOT Accel	1	0-40					
	WOT Accel	2	0-40					
(3)	WOT Accel	1	0-60					
	WOT Accel	2	0-60					
(4)	WOT Accel	1	20-50					
	CT Decel	1	50-20					
	WOT Accel	2	20-50					
	CT Decel	2	50-20					
(5)	Grade Perf.	1	0-____					
		2	0-____					

Idle 10 sec before each accel.
Hold max speed in accel 5 sec before each decel.

APPENDIX M-7. MEETING NOTES

Subject: Economic Evaluation Phase of Contract 68-01-0472 (SwRI Project 11-3634)

Meeting Dates: May 17 and 18, 1973

Attended by:
Jose Bascunana - EPA
John McFadden - EPA
Leroy Lindgren - Rath and Strong
Karl Springer - SwRI
Charles Urban - SwRI
Jack Wolfe - SwRI

The subject phase of the contract has as its objective to identify the cost impact of emission controls and/or engine modifications in heavy duty gasoline and diesel engines. Mr. Leroy Lindgren of Rath and Strong has been obtained as the consultant in this evaluation. Some of his directly related experience includes: the economic evaluation of light duty vehicles sponsored by the National Academy of Sciences (N. A. S.) and the economic evaluation of medium duty vehicles currently being conducted by CALSPAN. The purpose of this meeting was to better define the contract requirements and to develop a basic project approach which can meet these requirements within the time and financial constraints. Contract requirements are as follows:

> Economic Evaluation:
>
> The objective is to identify the cost impact of emissions controls and/or engine modifications found in the program for the "best combination" of parameters for both gasoline and diesel engines. Cost impact will reflect the 1975 to 1980 time frame. Cost considerations will include but are not limited to the following:
>
> 1. Unit costs for 1972 model year engines to be used as base reference.
> 2. Unit cost for the best control strategy. This will include but should not necessarily be limited to: development, manufacturing, capital equipment and other salient production cost considerations.
> 3. Vehicle operation costs such as fuel consumption, maintenance, replacement parts costs, etc.
> 4. Consumer costs if preliminary studies show this to be significant.

SUMMARY OF THE DISCUSSION AND CONCLUSIONS

Note: The numerical order of this section follows the order used in section IV of the subject contract.

1. Unit costs for 1972 model year engines - The manufacturers do not normally provide this base price information on the engines and direct extraction or extrapolation from the vehicle retail price information does not appear to be directly applicable. Therefore, indirect methods were discussed and tentative conclusions were reached.

   The base price is not as important to the project as the increase in price due to the emission controls. Therefore, the base price used is not of significant concern as long as it is realistic and consistent and the method for determining is documented. A distribution (or warehouse) selling price was decided on as the primary basis for these evaluations.

   With gasoline engines, considerable price information for light duty engines is available from the N. A. S. project. It appears essential to this project (funding is a percent or so of the N. A. S. project) to utilize this available data base. The approach initially taken will be to determine the base cost of similar light duty engines from the N. A. S. data, then arrive at a heavy duty factor from the relationship between the retail replacement price of the heavy and light engines. Where applicable, a volume factor would be determined using the learning curve computation method. The distributor price for the heavy duty engine would then be determined by multiplying the distributor price for the related light duty engine by the appropriate factors. A fixed percentage would then be used to adjust this price and obtain a price related to what the consumer pays for the engine when he purchases a vehicle.

   For diesel engines, there is currently no known base price data base. Therefore, a definite approach cannot be established at this time. Initially, a search will be made to locate diesel engine base price information, an attempt will be made to determine the cost to the U. S. Army for a known shipment of several thousand diesel engines, and base price information will be discussed with the engine manufacturers.

2. Unit costs for emission controls - For some of the emission control equipment items, such as EGR valves, the prices established for light duty components appears to be essentially directly applicable to heavy duty components. Items such as heavy duty air injection pumps can probably be projected from the fairly well established light duty prices. Heavy duty catalysts prices will require scaling of the current projected prices for light duty catalyst. In all cases, price information should be discussed with the respective manufacturers and comparisons made.

3. Vehicle operation costs - This area is one of the more difficult due to the almost complete absence of a data base in many of the areas. Reliable data on increase in fuel consumption due to emission controls is not expected to be available. At this point it appears that the relative fuel consumption determined in this and a previous contract will be the primary sources of fuel consumption data. Costs of added maintenance due to emission controls will also require significant estimations. Replacement parts costs can be obtained from and be as reliable as the unit costs developed in item 2. Primarily, in this area very good documentation of the assumptions and values used will be required.

4. Consumer costs - Basically this is interpreted to reflect the cost increase due to emission controls on the total cost for the shipment of goods. This primarily involves mathematically relating the information derived in the previous items 1 through 3 to the current unit costs (i. e., possibly dollars per ton mile) for the moving of goods by truck.

GENERAL DISCUSSION AND CONCLUSIONS

It was generally concluded that this program must make use of currently available related data such as the N. A. S. light duty data base. Also, that many assumptions will be required in areas where there is very little reliable information. In these areas it is extremely important that all data sources and assumptions be well documented.

Initially, the approach should be that the gasoline and the diesel phases each receive fifty percent of the overall effort in this economic evaluation. It appears that in the gasoline phase a significant data base will be fairly readily obtainable but that reduction of the data will be extensive, whereas in the diesel phase an anticipated smaller data base will be more difficult to obtain but that this smaller amount of data will be correspondingly easier to reduce.

Certification costs and social value costs should be included if applicable and can be determined.

PROJECT APPROACH

An outline of the current project plan is as follows:

a. Gather information on heavy duty (H-D) engines, H-D vehicles and on shipping costs.

b. Divide H-D engines into groups.

c. Determine a price for each emission control component which is scheduled for evaluation in this project.

d. Determine a base price for each group of H-D engines.

e. Determine maintenance and replacement costs for each emission control component.

f. Establish basis for calculations to determine the increase in fuel consumption.

g. Evaluate applicable certification and social value costs.

h. Perform the final calculations on the controlled configurations established in the laboratory phases of this project.

TABLE M-8. LABORATORY ANALYSIS OF TEST FUEL

Fuel Type	DF-2
Property	
Gravity, °API	34.5
Sulfur, % by wt.	0.3
Aromatics, %	37.6
Distillation, °F	
Initial Boiling Point	386
End Point	658
10%	436
20%	461
30%	481
40%	498
50%	514
60%	530
70%	546
80%	564
90%	605
95%	648
Recovery, %	99.0
Residue, %	1.0
Calculated Cetane No.	46.7